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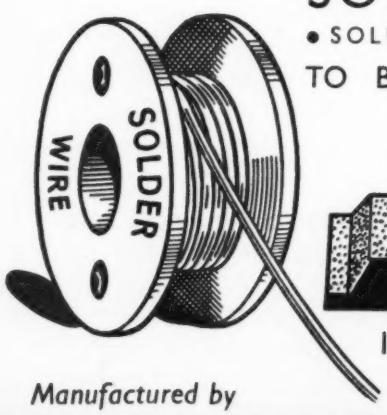

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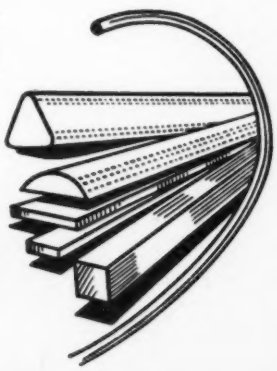

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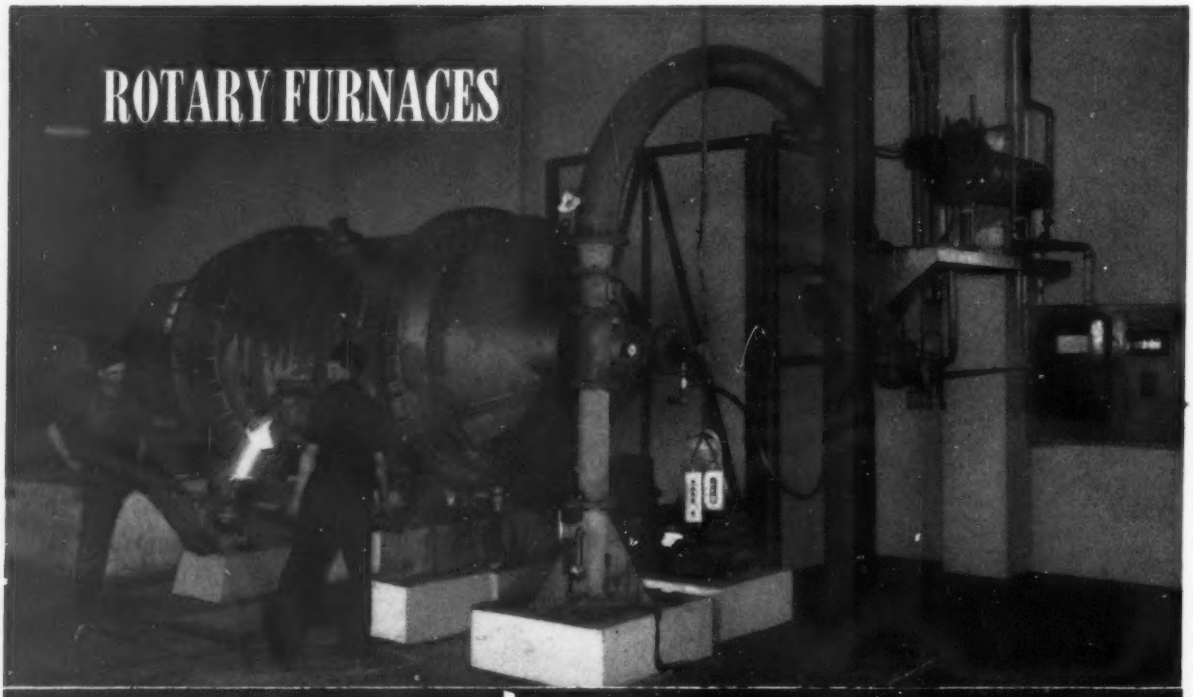

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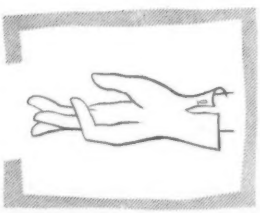

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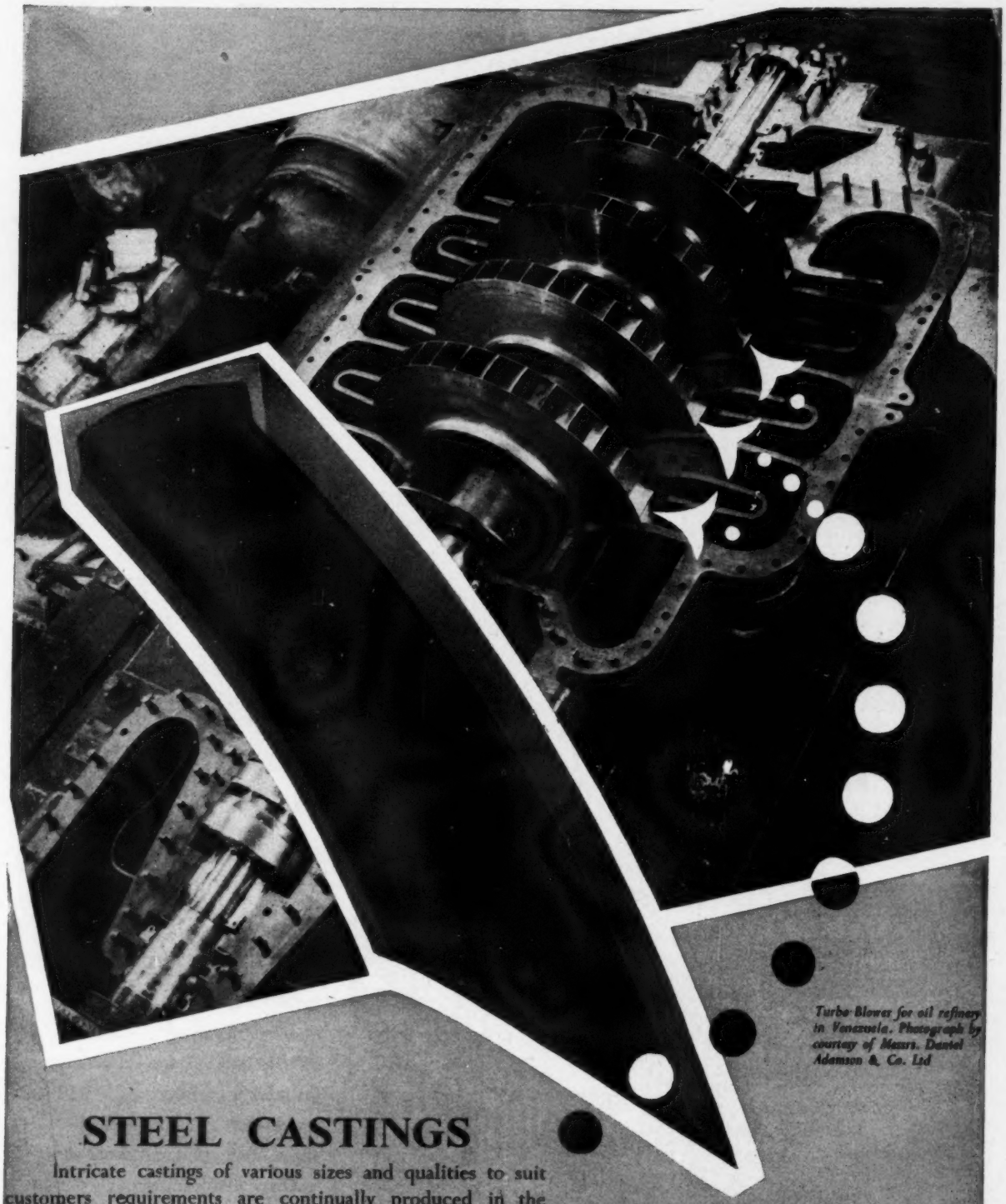

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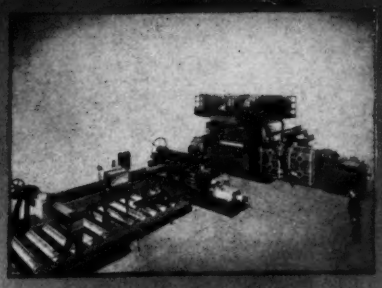

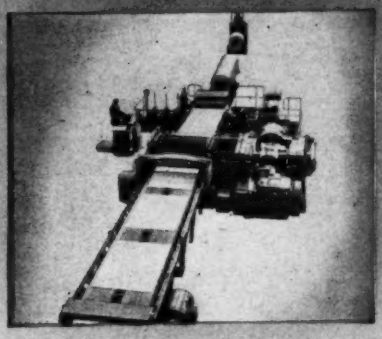

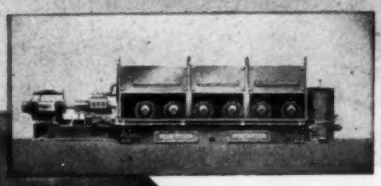

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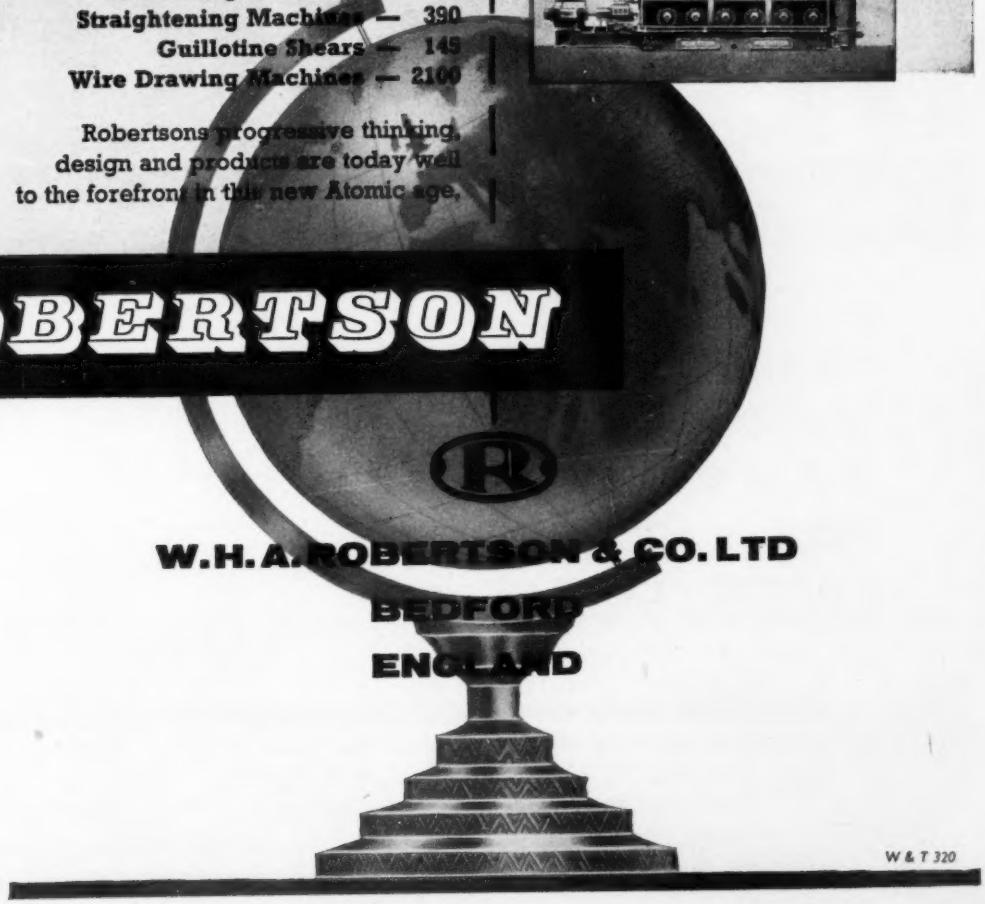

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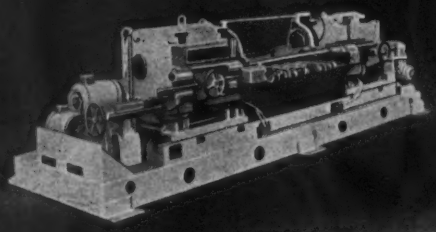

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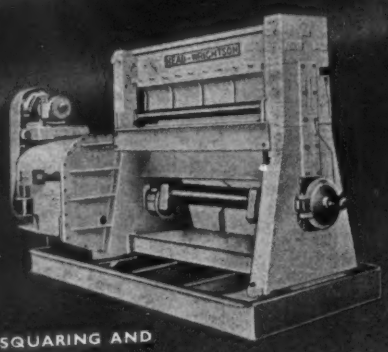

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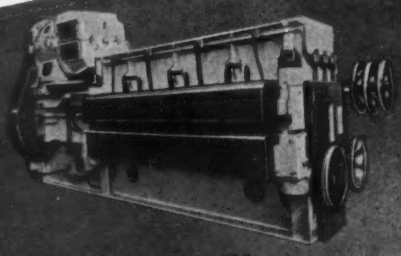

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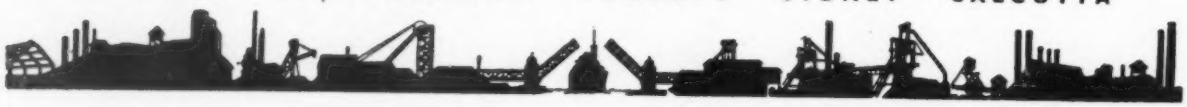

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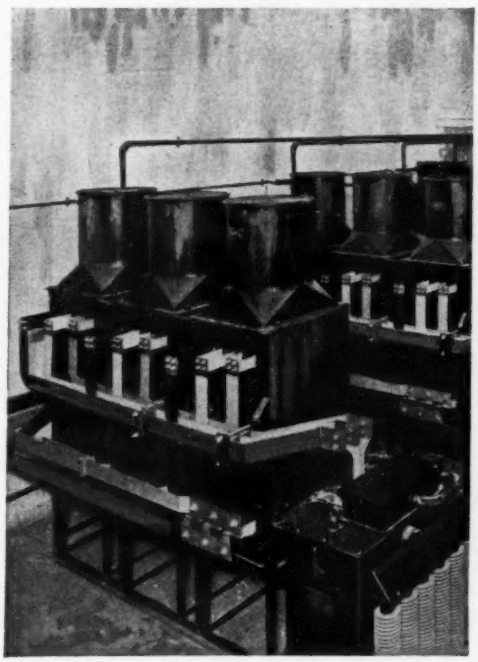

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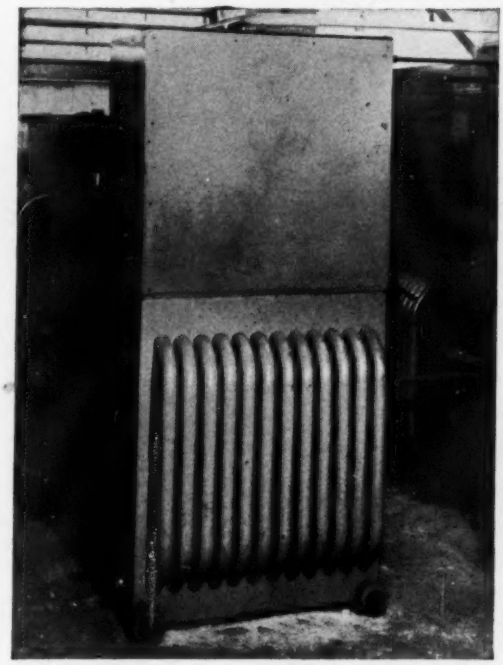

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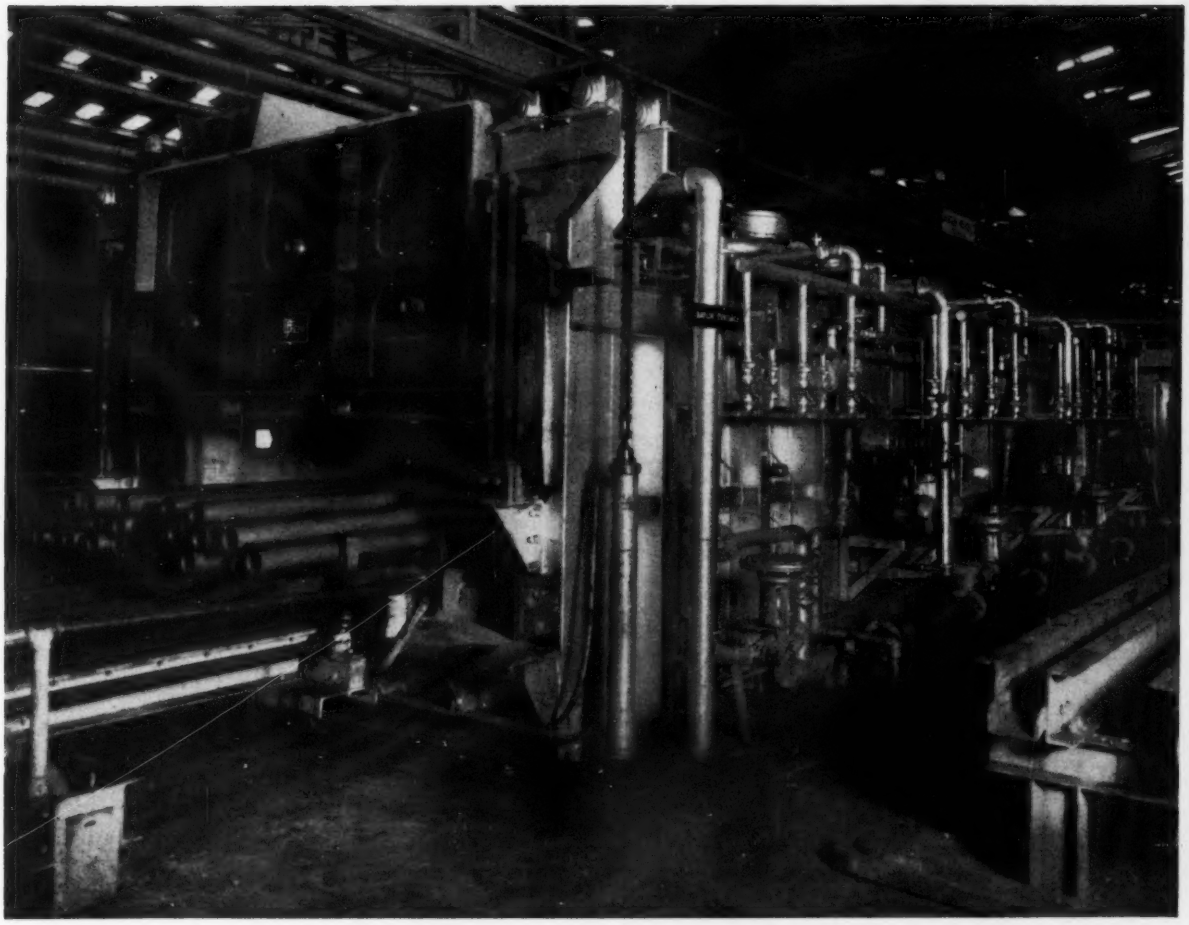

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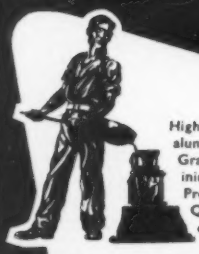
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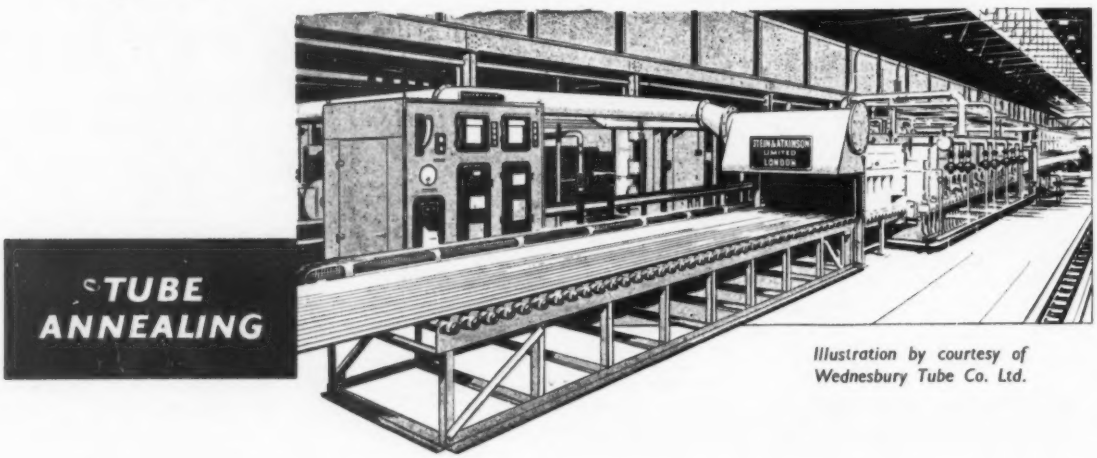

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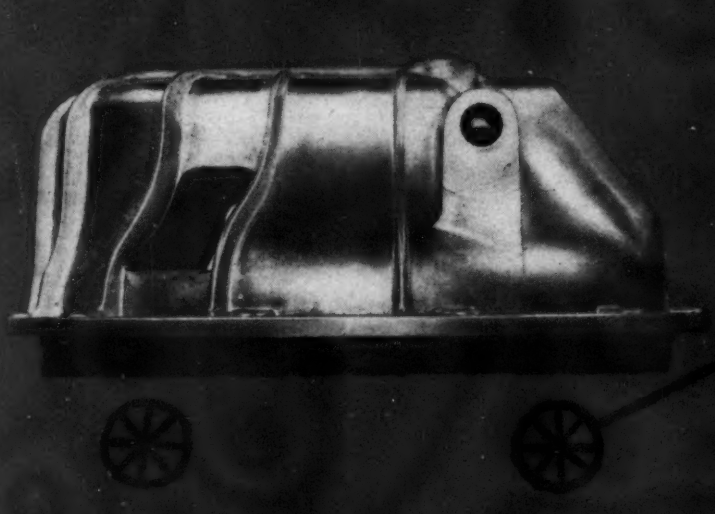

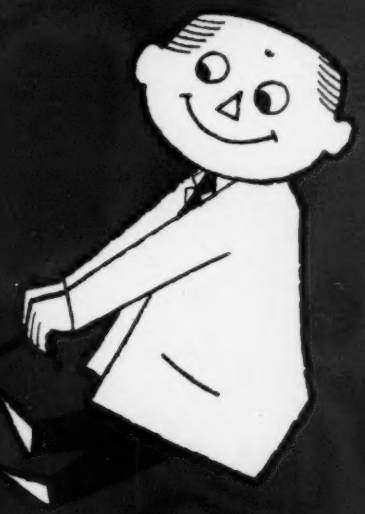

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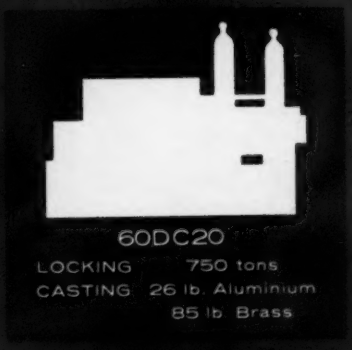

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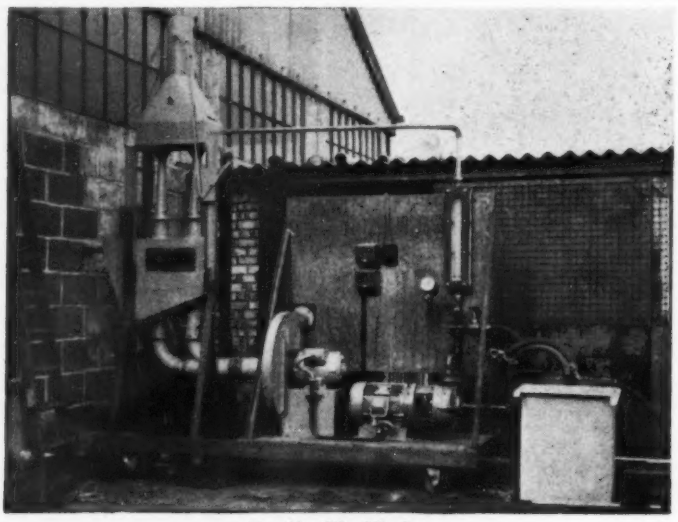

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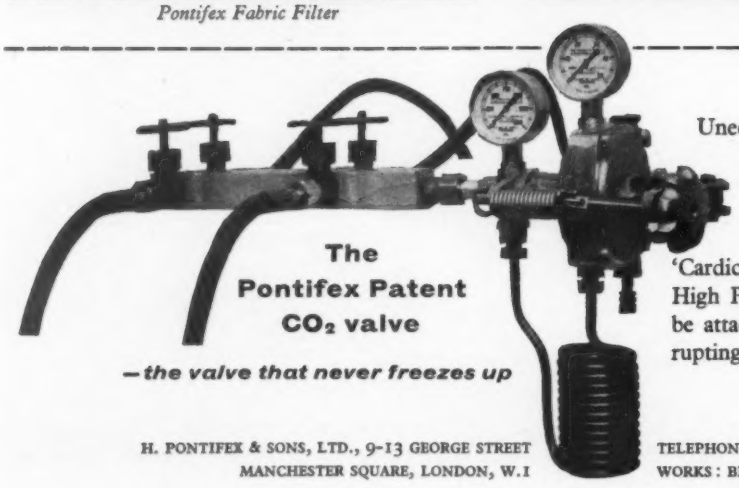

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FOUNDED 1909

EDITOR: L. G. BERESFORD, B.Sc., F.I.M.

11 SEPTEMBER 1959 VOLUME 95 NUMBER 5

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METAL INDUSTRY

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Progress in Standards

TO provide the goods and services required by the community at competitive prices and quality being the main purpose of industry, it follows that any means which enable quality goods to be produced in greater quantities at lower cost receive the closest consideration from industry. Since standardization and then simplification of the range of products is one of these means, and, indeed, one proved most effective in diverse industries, it is only to be expected that there should be a growing demand from industry for new standard specifications on which to base production and purchasing requirements. That such a demand does exist is evident from the Annual Report for 1958-59 of the British Standards Institution.

The growing support given by trade and industry to the work of the B.S.I. is apparent from a further big rise in the number of new subscribing members; compared with 8,650 in 1956, the total at March 31 last was 10,605—an increase of 6 per cent over the figures for the previous year. Although the range of new projects is ever-widening, the total number of new standards published was slightly less than in the previous twelve months, but "there has been a sharp increase in new projects to be undertaken in the technical divisions; in the engineering division 144 compared with 92 last year; in the chemical division 48 compared with 16." Among the technical activities referred to in the report are the co-ordination of the many existing standards for steel and other basic materials, and the continuing efforts to develop standards for smoke control.

Standards themselves are of little value unless they are used effectively in production. It is, therefore, gratifying to note that efforts are continuing to ensure that this is being done by maintaining close contact between the B.S.I. and those who use standards, and by promoting education in standardization through conferences and discussion groups at various levels in industry, as well as among students. Technical colleges, in particular, are being encouraged to place emphasis in their courses on standards techniques.

There was also a further increase in the number of British Standards under which certification mark schemes operate; the total now standing at 145. Copper tubes are among the products for which certification schemes are being considered. Is it not time that the bronze and brass founding industry gave serious consideration to adopting such a scheme for its products? We are well aware that such a course has been advocated by certain members of the Association of Bronze and Brass Founders, but we doubt whether the majority realize the rapidly increasing impact of standards on all aspects of export business, as evidenced by the growth of international standards work, the sharp rise in demand for overseas standards by British exporters, and the attention being given to publicity for British Standards overseas. Thus, increasing attention is being given, says the report, to the translation of British Standards, or summaries of them, into foreign languages, it having been suggested, for instance, that translation of some of the most important into Spanish would be invaluable to our trade with South America. In view of this, and of the fact that the work of the various Standards organizations the world over is becoming increasingly important in the business of international trade, a typical instance being the proposed integration of standards among the countries of the European Common Market, it is obvious that the benefits of buying to a recognized standard will soon be universally realized. Any industry that adopts the "kite mark" should, therefore, be in a favourable position.

Out of the MELTING POT

Liquid-shielded Etching

IN spite of considerable progress made by chemical milling or machining, the attitude towards the liquid etchant is still basically a defeatist one. Control over the composition and temperature of the etchant are readily possible. The etchant can be recirculated, filtered to remove any precipitate formed by the products of the etching reaction, and the etchant can be made up by the addition of the necessary compounds, or a spent etchant may be regenerated and finally returned to the process. Beyond all this, however, control over the etching liquid is seldom extended. The onus of providing the further control which is necessary, if the required results are to be produced, is placed entirely on the work being treated. As is well known, such further control is achieved by masking of the surface, control over the immersion of the work in the etchant, techniques involving repeated masking, and so on. The idea of exercising control over the "configuration" of the etchant is by no means new. It is to be found, for example, in the not unfamiliar process of electrolytic jet machining. In chemical machining, also, there has now recently been the suggestion of applying the etchant to the surface (which may or may not be masked) in the form of a jet from a nozzle or nozzles having a suitable cross-section. As a further development, other nozzles may be used to deliver a "wall" of liquid, immiscible with the etchant and which serves to confine the latter so that it impinges only upon those areas of the work which it is desired to etch. In addition to the various effects and advantages that may be achieved by the above procedure, the application of the etchant in the form of a jet also permits the effectiveness of the etching action to be increased by aeration of the liquid, and there is also the benefit derived from the mechanical action of the jet on the surface being etched serving to remove surface films and any insoluble deposits.

Usable ?

PROVIDED they are treated with a due sense of proportion, broad general suggestions and words of wisdom both have their place in the scheme of things. Bearing this in mind, it may be hoped that those currently engaged on investigations of dislocations and dislocation mechanisms in metals subjected to various types of stress will accept the broad general suggestion that they should look out for possible direct practical applications of the various phenomena they are studying. At present, the findings of research in the field of dislocations are providing a most useful insight into the reasons for how and why metal crystals are formed and metal grains behave in the manner they do. These deductions, however, are not the direct practical applications envisaged in the suggestion made above. Such applications would resemble those uses to which what might be called the microscopic and submicroscopic properties of materials are now being put (very often using only microscopic or submicroscopic quantities of the materials) in transducing, rectifying, amplifying and switching devices in electronic apparatus. Considered from the point of view of such applications, dislocations already have the initial advantage of having the right order of size. It is likewise known, in a general way, that deformation of metals results in the emission of electrons. The next step would, therefore, be to investigate any closer connection between the dislocations and electron emission. Assuming that the formation of a dislocation or of a slip line is accompanied by the emission of even just one or two electrons, the rest would be simple: a minute element of metal being acted upon by minute electromagnetic forces, and the electrons emitted being carried away to produce some desired suitably amplified effects in the associated electronic set-up. Then, again, the moving step of a screw dislocation on the face of a growing crystal would seem to be just made for the job of transducing something to something else. Admittedly it is just a suggestion. . . .

Relating Details

TO the classical metallurgists, mention of an investigation of the wetting by molten metals of the solid surfaces of refractory oxides would probably conjure up pictures of metals in melting furnaces or melting pots. Once out of the melting pot, there might arise the various problems of the interaction of molten metals with moulding sands or, more recently, with refractory investment compositions used in precision casting, and, more recently still, of the interaction of molten titanium with mould materials ranging from sand to graphite. Metallurgists of a few years ago might have been brought to think of cermet compositions and the empirical results showing whether or not some particular conglomeration of a metal and a powdered ceramic would, in fact, yield a coherent body. To-day, investigators have reached the stage at which an investigation of the wetting of refractory oxides by molten metals is no longer a matter of finding out whether or not a given metal will wet a given oxide, but carries on to try to discover some of the basic common factors associated with this phenomenon of wetting. This means the need to investigate a series of metals and a series of oxides. Thus, a recent investigation was intended to confirm the existence of a theoretically probable relation between the electrical conductivity of oxides and their ability to be wetted by metals. The refractory bodies used had various compositions selected from the MgO-NiO, MgO-CoO, Al_2O_3-Cr_2O_3 and $Mg.Cr_2O_3$-Fe_3O_4 systems, giving them different conductivities while their other relevant properties were so far as possible the same. The metals used included pure tin, silver, copper, nickel and iron, the method being the familiar one of measuring the angle of contact between a drop of the metal and the plane horizontal surface of the refractory oxide body. The results supported the hypothesis that conductivity electrons play a part in the wetting of oxides by metals, the wettability being found to increase with electrical conductivity. Furthermore, the conductivity was found to be related to the thermodynamic stability (heat of formation) of the oxides. A calculation, on this basis, of the angle of contact gave results in reasonable agreement with experimental values.

Skimmer

Machining in Barrels

By D. J. FISHLOCK

(*Concluded from* METAL INDUSTRY, 4 *September* 1959)

A MAJOR factor leading to the opinion that barrelling is reaching the limit of development is the restriction placed on speed of rotation—which inevitably reflects on the speed of processing.

Although in the U.S.A. there is less tendency to show concern over long barrelling times than here, and operations commonly continue for several days, they have none the less evinced considerable interest in the possibilities of techniques in which the components are moved through the abrasive, instead of vice versa. These, although again not new in conception, since their prototype was patented in 1891, offer material advantages by way of speed of processing—often reduced to minutes—and, as with fixtured barrelling, the elimination of nicking due to components coming into contact.

One highly specialized machine of this type was evolved in Britain, however, this being the Roto-Ram machine. The principle of this device, developed for the surface treatment of long, slender components, is their horizontal reciprocatory movement through a typical barrelling media comprising chips, compound and water. Initially it was designed to deburr and remove the surface imperfections known as stress-raisers in high tensile alloys, and it has found acceptance in the aircraft industry for treating components such as spar-booms and helicopter blades.[5]

The essentials of this machine include a steel tank, with provision for flushing out, which holds the media, Fig. 12. A fixture actuated hydraulically or pneumatically holds and reciprocates the components, while this can be rotated horizontally through 180° to ensure uniformity of finish.[6] Two factors, the length of stroke and its frequency, replace the rotational speed of a barrel; these are variable, usually from 6 to 12 in. and from 0 to 60 strokes/min. respectively. Strokes of less than 2 in., however, allow no abrasive action of the media on the metal since the adjacent chips move with the job. Treatment times of 1 hr. are quoted.

The latest advance in the application of this type of machine is for the finishing of aluminium alloy helicopter spars up to 30 ft. and over in length; such machines have a modified movement which allows each spar to idle on one stroke to avoid the risk of compressive buckling. An American machine, the Burr-O-Matic, has the advantage of being linkable in order to accommodate very long components: each individual unit can handle parts up to 10 ft. 6 in. long.

Gyrofinishing, a development of General Motors, is a high speed loose abrasive finishing process.[7] A tank or drum of abrasive is driven at speeds sufficient to achieve an abrasive flow of 1,500-1,800 surface ft/min. past the work. Articles are fixtured and either lowered into the abrasive in the case of the vertical tank machine, or continuously traversed through the revolving drum of the horizontal unit. In the vertical unit the component can also be counter-rotated, while in either machine it can be orientated or oscillated to achieve more flexibility in the operation. A typical processing time is about 1 min.

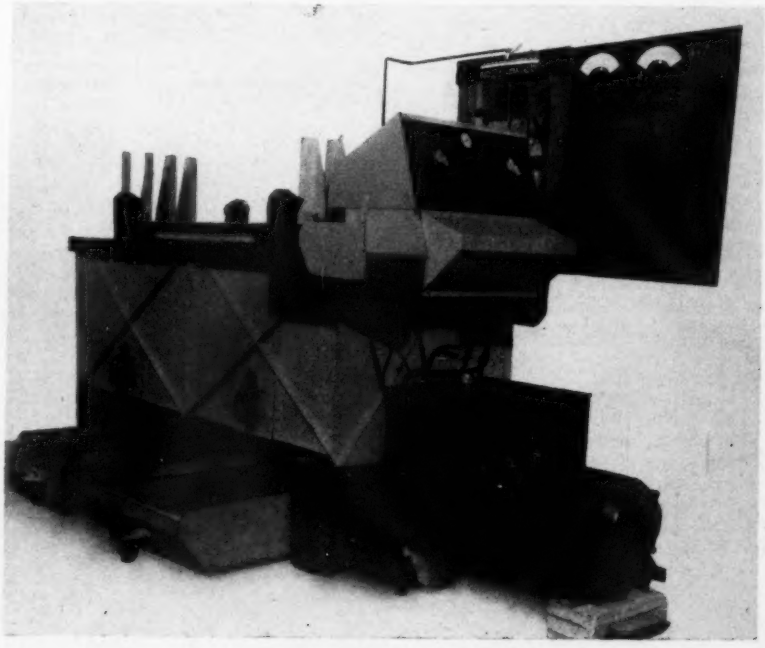
Another process which utilises dry abrasive masses for producing very high finishes is Spin-Finishing. In this the components are mounted on vertical spindles which revolve clockwise around a tank of abrasive; each individual spindle, however, rotates counter-clockwise at 280 r.p.m. Both directions of movement can be reversed to ensure uniformity, while an average time of treatment is 6 to 8 min. The heat generated within the abrasive is considerable, but is reduced by water-jacketing the tank and by blowing air into the abrasive.

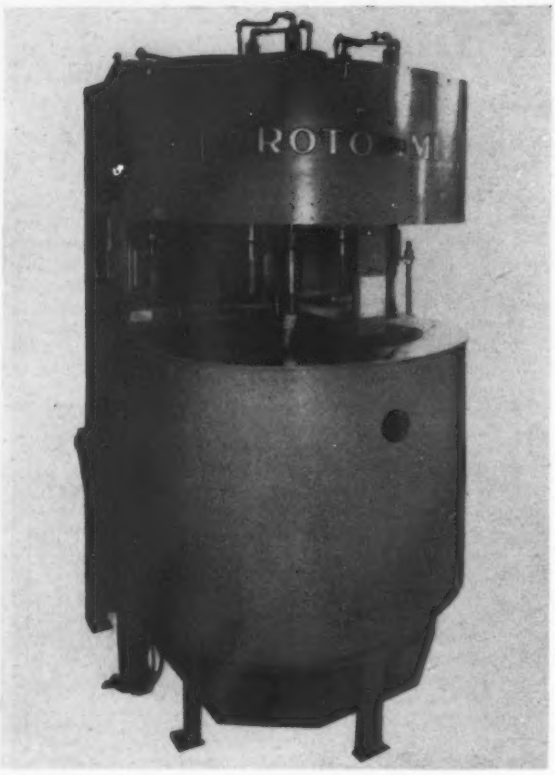
Machines such as the Roto-Matic, Roto-Mite (Fig. 13), and Roto-Flow units employ a mass of chips, compounds and water similar to that used in barrelling itself. The first two are both spindle machines similar to those described above, while the Roto-Flow design employs a rotating jig mounted on a horizontal shaft. Radial arms of the jig terminate in the components which plunge into and traverse a large tank of the abrasive media. This is currently in use for polishing items such as bumper over-riders and car door handles.

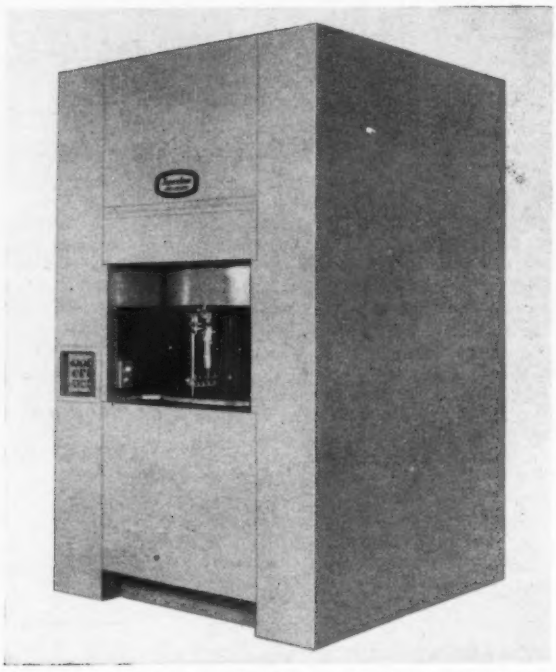
Also, mention must be made of the ingenious Ger-O-Matic polishing technique in which components—both ferrous and non-ferrous—are gently scrubbed with spinning rubber brushes in a tank of an abrasive slurry. The "brushes," some 16-17 in. dia. have many rubber fingers of round or square section depending respectively on whether the surface is recessed or flat. They revolve at 375 to 500 r.p.m. The process can be used as a final finish prior to electroplating.

The Almco-matic spindle machine is claimed to combine both grinding and finishing into one operation (Fig. 14). Components are affixed to the lower end of vertical spindles which rotate at 14 r.p.m. These are attached to a variable-speed index head drive which provides complete indexing in from 1 to 9 minutes. The components are immersed in an abrasive mass—usually

Fig. 12—Prototype Roto-Ram machine with which Roto-Finish are carrying on further research and development into the finishing of very long components







Left: Fig. 13—The Roto-Finish Roto-Mite machine has four spindles, on a spindle head assembly, which rotate but do not index through the mass

Above: Fig. 14—Almco-Supersheen Almco-Matic spindle machine, which has a drum containing 12 to 20 mesh aluminium oxide chips rotating at 275-600 s.f.m. past the components

12 to 20 mesh aluminium oxide chips with compounds and water—contained in a counter-rotating drum at 275 to 600 surface ft. per min. (centre line of spindle assembly). This machine can generate a 0·005 to 0·015 in. radius on hardened gear teeth in about 2-4min.

Interesting and valuable though developments in special machines may be, however, it must be emphasized that their cost is very high—6 to 10 times that of barrelling machinery. It is therefore feasible to consider their installation only when barrelling fails to provide a satisfactory solution.

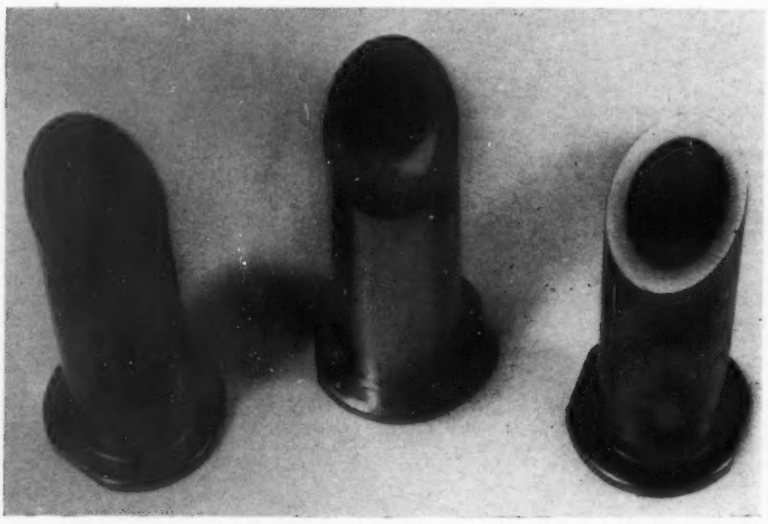
By using a vibratory motion in place of the rotary action of the conventional type barrel it is claimed that a range of machines now being produced by the Roto-Finish Company of Kalamazoo, U.S.A., offer many advantages over the conventional type barrel.

Among the improvements claimed are faster and better descaling, deburring, radiusing, blending, smoothing and cutting down, britehoning and colouring. It is said that the new system is four to six times faster than the rotary barrel. In other words, one of the new machines will do the same

Fig. 15—Sliding action characteristic of conventional barrel machine

Fig. 16—Three-way vibration produces overall rotary motion

Fig. 17—Three steel tubes, of which the centre one has not been processed and shows a heavy burr. Those on the outside have been processed by vibratory barrelling



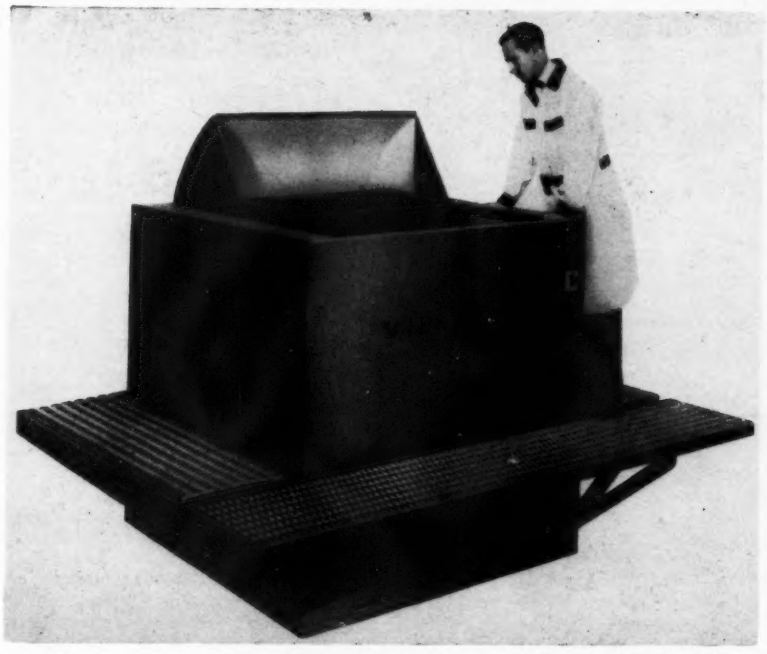


Fig. 18—One of a range of four Vibratron machines, this one has a capacity of 7 ft³

work in a given time as four to six barrel type machines of the same cubic capacity, with consequent savings in time, labour, materials and floor space. The reason for this increased efficiency is that in conventional barrelling the abrasive action takes place in a sliding zone several inches deep extending the width of the rotating cylinder (see Fig. 15). Beneath the zone little or no relative motion takes place between the components and the processing media, the mass being carried around in a position of repose until the point is reached where it commences to slide. Thus, very little work is accomplished in zone "A." With the new vibratory system, the container holding the mass is subjected to a three-way vibration which produces an overall rotary motion of the whole mass (see Fig. 16), and, at the same time, movement of the individual chips in random directions. As the movement zone extends throughout the entire mass, work is accomplished much more rapidly.

Internal surfaces are treated as rapidly and as effectively as external surfaces. With the conventional rotary system, the amount of work that could be done on internal surfaces was severely limited. The vibratory system, however, with its three-way movement of the chips, means that the media can flow through cavities at the same rate as over external surfaces. Fig. 17 shows three tubes, the centre one of which has not been processed. The size of the burr is considerable and it would not be possible to remove it by conventional barrelling. The best that could be achieved would be a "rolling-over" of the burr. The other two tubes shown have been processed in a Roto-Finish Vibratron, and the burrs are shown to be cleanly removed.

Larger work loads relative to capacity can be accommodated in the new type machines. This is due to a number of factors, the main one being that, as less impingement is caused, fewer chips are necessary for cushioning purposes. Thus, a greater work load can be accommodated per overall cubic capacity of a machine.

The machines have an open head container, so that visual control of progress and process is possible. A single component can be taken from the plant, whilst in operation, for immediate visual inspection and then dropped back.

The system is intrinsically more adaptable and flexible. "Continuous flow" processing, where the parts emerge at the same speed at which they enter, can be arranged without difficulty.

A 7 ft³ capacity Vibratron is shown in Fig. 18. It is one of a range of four machines, with capacities from 1-7 ft³, produced by Roto-Finish U.S.A. Roto-Finish Ltd., Great Britain, have been working for some time on the development of a range of vibratory action machines with features and capacities suitable to European industries. They are also developing a 2-tank vibratory machine which, it is claimed, has further advantages over the single tank type.

References

[5] Anon; *Aircraft Production*, 1957, January

[6] F. T. Hall; *Proc. Am. Electroplaters' Soc.*, 1958, 37.

[7] G. R. Squibb and F. T. Hall; *Met. Ind.*, 1956, **89**, 333.

Aluminium Alloy Extrusion

AVAILABLE press capacity may be the sole factor in determining the lowest temperature at which a product can be extruded. On the other hand, if the temperature is too high, undesirable metallurgical changes may occur. This upper temperature limit depends on both the temperature of the billet and on the heating-up of the product caused by conversion of the work of deformation into heat.

Specimens of 99·5 per cent pure aluminium and a high-strength aluminium alloy (D.T.D.363) have been extruded in a hydraulic press at billet temperatures ranging from 20° to 450°C. The effect of ram speed and extrusion ratio (the ratio of the cross-sectional area of the billet to that of the product) on the extrusion pressure and temperature rise in the product has been studied.

The temperature rise resulting from the work of deformation can be quite large. For example, at an extrusion ratio of 200 and a billet temperature of 300°C., there is a temperature rise with aluminium of 170°C. at a ram speed of 30 in/min. For comparable extrusion conditions the temperature rise in the alloy is greater than in the pure metal.

In work described in NEL Plasticity Report No. 146, hot shortness (cracking of the surface of the product) occurred in the alloy under various combinations of billet temperature, extrusion ratio, and ram speed This failure took place when the temperature of the product reached about 480°C. If this alloy is extruded at the usual billet temperature of 400°C., ram speeds must be kept low to prevent the onset of hot shortness.

For extrusion ratios greater than 4, it was found that there is a linear relation between the extrusion pressure and the logarithm of the extrusion ratio. There is also a linear relation between extrusion pressure and billet temperature.

Preliminary investigations of the effects of extrusion conditions on the hardness, tensile strength, and dimensional accuracy of the product have also been made.

Hot Brass Pressings

ADVANTAGES to be gained by the use of hot pressing and forging, when applied to brass and other copper-base metals are fully described together with the various stages of manufacture in C.D.A. publication No. 58. Details are given of the relevant material properties, the presses and tools employed and some useful hints on design are included.

This publication is obtainable free upon application to Copper Development Association, 55 South Audley Street, London, W.1.

PROCESS FOR COMMERCIAL PRODUCTION OF THIN CHROMIUM SHEET

Metal-Diffusion Techniques

ONE of the most widely-used applications of the principle of metal diffusion is "chromizing"—that is, the diffusion of chromium into the surface of the parent metal, which is usually mild steel or cast iron. Various methods of chromizing have been in commercial operation since 1941, but up to 1958 only two methods have been operated in the United Kingdom to any appreciable extent.

All metal-diffusion processes are thermal and consist basically of the removal of atoms of metal from the surface of the article treated, and their replacement by atoms of the diffusing metal. The atomic interchange is controlled by catalysts and other media, as well as by temperature and time. With chromium diffusion into mild steel or cast iron, where the atomic masses are very similar, no measurable alterations are effected in the dimensions of the article treated, except those alterations which would be brought about by normal grain growth under heat-treatment. If the article to be chromized is suitably heat-treated before machining, the final dimensions remain virtually unaffected.

Metal-diffusion processes are utilized to impart protection against the effects of heat, corrosion or wear, to a degree which was previously achieved only by the use of expensive steel alloys. When the desired surface qualities are provided by metal-diffusion treatment, the parent metal can be selected on the basis of such considerations as cheapness and machinability. Metal-diffusion techniques already developed are not confined to the field of chromizing, although, for the majority of commercial applications so far encountered, surface diffusions of chromium, or of chromium and aluminium, have proved satisfactory. However, experiments have shown that diffusion techniques employing other metals, such as niobium, tantalum, molybdenum, vanadium, beryllium, etc., are equally practicable, but these extended applications have not yet been carried out on any significant scale.

In 1958, the patented "Dicrom" process of metal diffusion was first brought into commercial operation by Metal Diffusions Ltd., of Isleworth, Middlesex. This process overcame various defects and disadvantages previously experienced in metal-diffusion techniques.

Effects of Treatment

With this chromizing process it is possible to produce a depth of diffusion of between 0·001-0·015 in., depending on the metallic analysis of the article treated. The function which the article is to perform determines the depth of diffusion which can be economically justified. The principal advantage of the process is the high purity of chromium provided at the surface. This is always above 60 per cent. Surface-purity values up to 96 per cent can be obtained; however, for most commercial applications a depth of diffusion of from 0·003 to 0·005 in., with a surface concentration of chromium between 60 per cent and 75 per cent, has provided very satisfactory results.

The superior surface properties ensure that, in cases where special resistance to oxidation is required, at temperatures up to 1,180°C., mild steel can be treated to afford the same resistance to corrosion as that afforded by a 40 per cent nickel-22 per cent chromium alloy steel — usually at between one-third and one-half of the cost. Employing combined chromium-aluminium diffusion, effective resistance to corrosion at temperatures up to 1,305°C. can be achieved.

Hitherto, chromizing has been mainly employed as a means of increasing the life of grill-frets for gas stoves and of burner parts for paraffin-type domestic heaters. However, the higher percentage of surface chromium provided by the "Dicrom" process permits fuller use to be made of the physical properties of chromium—namely, its extreme hardness, its resistance to abrasion, its virtual immunity against oxidation or attack by many chemicals (including sulphuric and nitric acids) and its low coefficient of friction—bearing in mind the wide temperature range over which all these properties are maintained. Furthermore a surface chromized in this way can be electropolished to produce a finish comparable with chromium plating, while retaining the advantages of resistance to heat and of inseparability from the parent metal. The overall cost is also competitive.

Chromium Sheet

In the course of development it was realized that this new technique afforded an opportunity to produce thin chromium sheet. As an outcome of this, it is now possible to produce this hitherto-unobtainable material with a purity as high as 96 per cent. This important development is akin to the "lost-wax" technique, which is employed in the manufacture of jet engine blades; the sheet-steel "pattern" (like the wax) virtually disappears—being replaced in this case by chromium sheet of similar dimensions and finish. The commercial and scientific uses of chromium sheet, which is surprisingly ductile, are in course of assessment; it is already under consideration as a lining for chemical vessels and for fuel chambers in space rockets.

Readers' Digest

HARDNESS TESTING

"Handbuch der Harteprufungen nach Brinell, Rockwell, Vickers." *Published by Springer-Verlag, Berlin, for Georg Reicherter, Esslingen/Neckar. Pp.* 136 + 70 *pages of Tables. Price DM.* 12·50.

THIS handbook on hardness testing is unique. It not only describes the different methods of hardness testing with Brinell, Rockwell and Vickers machines, but also explains how to test various intricate objects. All the testing machines described are manufactured by Georg Reicherter. They include hand operated and automatic operated types from which the impressions may be measured microscopically or from direct reading. The relationships between diameter of ball and load, for the various ferrous, light and lead alloys are dealt with both fundamentally from the measurement of diameter of the impression and the depth of the impression.

Various types of hardness testing machines are illustrated, together with numerous jigs for testing coil springs, teeth of gear wheels, the wearing parts of worm shafts, crankshafts, ball races, drills, ball bearings, gas engine tappets, and many other intricate machine parts.

A number of quick measuring eyepieces for both Brinell and Vickers hardness testing machines are described and illustrated, some with tolerance factors which can be set for routine testing.

Some 70 pages of tables give the relationship of hardness with the measurement of the impressions made by either Brinell ball or Vickers Diamond Pyramid under various loads. Equations are given for calculating the minimum thickness allowed for a given load, and for obtaining the approximate tensile stress of carbon steels, nickel-chromium steels; also for obtaining the relative Brinell, Vickers or Rockwell hardness number from any one test together with a table showing relative values from 100 Brinell hardness to 900 Vickers and 67·3 Rockwell C hardnesses.

This is an excellent reference book on hardness testing, unfortunately, from the point of view of English readers, written in German.

D. Ll.

Metal Industry, 11 *September* 1959

Die-Casting Review

Die-Cast Colour Slide Projector

IN the normal course of the manufacture of any product sold on the consumer market, there must be a constant re-assessment of values, and an acute awareness of trends in design. If these conditions are not fulfilled, competitive products rapidly gain ground, and a product that may have been of excellent design and manufacture a few years, or even months, previously is likely to lose favour in the public taste. Thus, methods of manufacture, materials, finishing processes and design must come under constant review, and it may be assumed with a fair degree of certainty that where a range of products is held high in public esteem for a number of years, the manufacturers have been especially concerned in keeping abreast of trends in production as well as in popular taste.

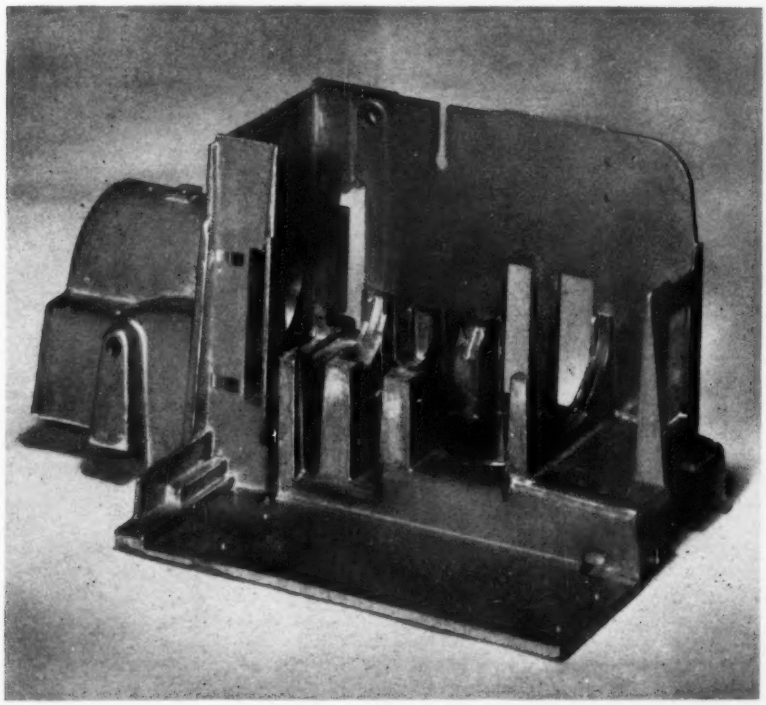
As an example, few better illustrations could be cited than the widely-known Aldis range of slide projectors. When colour photography began to come into its own not very long after the end of the war, Aldis rapidly built up an international reputation for their projectors, which had the smooth lines and robust construction, coupled with popular prices, that the market demanded.

Designs were modified and the range was added to as the years passed, and still the demand grew. For some of the components pressings gave way to pressure die-castings, but there was no fundamental alteration to the shape until 1958. In the interim, the more compact Aldisette had been introduced; developments in the optical system enabled a larger picture to be projected at a shorter distance from the screen, and higher wattage lamps with improved cooling were adopted. The shape, however, was still typical; until early 1958 almost all projectors revealed their development from the old lecture room lantern. They were taller than they were wide, and the housing carrying the lens projected from the front like a gun from a turret.

Trends, however, were becoming apparent. Automatic slide changers had become widely used, portability was becoming more important, and improved cooling was still needed. So, in 1958, the Aldis 303, shown at the head of this page, was introduced, a complete breakaway from earlier models and designed entirely around pressure die-castings. Indeed, in a design of this kind, where so much depends on the ability of the die-castings to provide locations, seatings, and so on, it is fair to say that without pressure die-casting the design would be economically impossible. This view will be made clearer in the following descriptions of the die-castings used in the "303."

Basic to this projector assembly is the chassis (Figs. 1 and 2), for it is on this aluminium die-casting that the whole of the optical system is mounted. This represents a complete departure from previous models and, as will be seen, eliminates a considerable amount

Fig. 1—Pressure die-cast chassis of the Aldis 303 projector



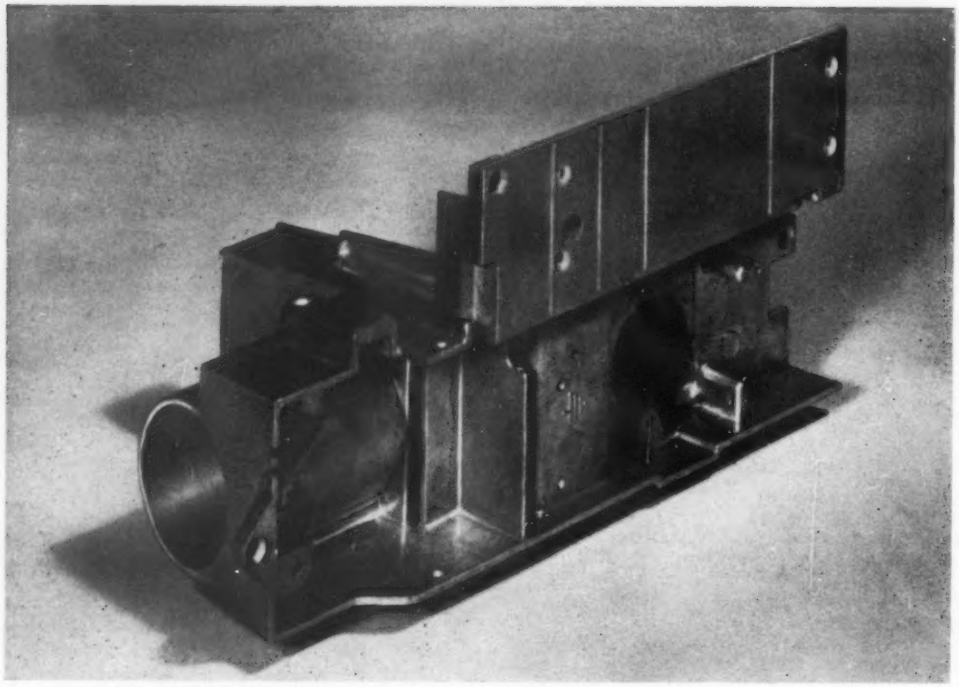


Fig. 2—The underside of the chassis; comparison of this illustration with the previous one indicates the complexity of the casting and how the inner and outer contours follow each other

of assembly work. Each of the four saddles rising from the base of the casting (Fig. 1) carries one of the elements forming part of the optical system. They are not machined in any way, they have cast-in locations, and are held to close limits (±0·003 in.) for separation and alignment. Final alignment with the lens is achieved when the slight taper is removed from the lens housing, which is bored true off the condenser seatings.

At assembly, the tops of the various elements of the optical system are held accurately in position by a small clip that locates in the vertical slot in the upper edge of the chassis casting.

Between the rearmost saddle, which carries the reflector, and the one in front of it, a platform is cast beneath which is mounted the lamp seating, and provision for adjustment of lamp height is provided, since even slight variation in the filament height of lamps may impair the quality of the projection. At the side of the lamp platform, two slots are cored through the wall to permit cool air to enter and be drawn across the lamp.

At the rear end of the chassis a thin wall, cast at right-angles to the side wall and ribbed at its other end, provides both additional rigidity and mountings for the switch, for which a rectangular aperture is cast in.

Immediately forward of the cast-in optical seatings is a platform for the slide carrier, two slots being cored in the chassis walls at each side. Spring locations (small square apertures) are also incorporated in the casting, and in operation a leaf spring holds the slide carrier lightly against the rear edge of the cast-in slots.

The lens housing is formed as part of this casting and is designed to accommodate the helical thread on the lens tube. Beneath the lens housing, the casting forms a rectangular pad stiffened on the underside by two ribs. A boss on the side of this pad is subsequently drilled for the spindle of the tilt knob, and a recess is provided for a retaining nut.

At the side of the casting a flat platform forms the base on which the motor mount bracket (Fig. 3) is fitted.

In spite of its complexity, the only machining operations carried out on this casting are: bore lens housing; drill 8 holes; countersink, drill hole for knob and drill for spindle.

The motor mount bracket (Fig. 3) is a zinc alloy casting, and is characterized by its louvre slots. These are set at an opposing angle to those in the body casting (Fig. 4) in order to eliminate light leakage as much as possible. Cast-in rivets are incorporated at the ends of the feet and the pillars at the top, and these are spun over on assembly to secure a pressed baffle that ensures maximum extraction of air from the area immediately around the lamp. In the feet, four holes are cored, and the subsequent

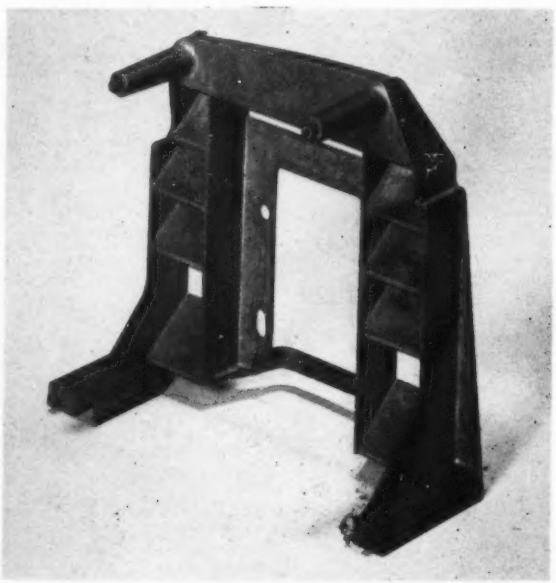


Fig. 3—The motor mount bracket. This component carries the motor and provides venting louvres in addition

tapping of these is the only machining operation carried out on this component. Four further holes are cored for the mounting of the motor and fan.

A feature of this model is the high degree of cooling obtained by using a large extraction fan placed at the side of the lamp, instead of a blower fan beneath it, as in previous models. It is thus possible to draw all hot air out and obtain a flow of cool air past the slide and lamp much more efficiently, since with blower fans there is a build-up of pressure, however slight, within the lamp house, and a tendency for pockets of hot air to remain, a characteristic absent in extraction-cooled units.

So far as the styling mentioned earlier is concerned, the two castings described are fundamental to the design: they are the key to the whole structure. But, so far as the visual appeal is concerned, the two remaining castings, the body (Fig. 4) and the lid (Fig. 5) are those in which the styling is most apparent. The lines are smooth and clean, they have a solid appearance, and enable the whole instrument to be handled as easily as a portable typewriter.

The body, an aluminium die-casting, has a rectangular base, with tapered walls that completely enclose the chassis assembly. Cast-in louvres beside the motor facilitate air extraction and keep down stray light, and two cored slots in the wall allow the slide carrier to be passed to and fro. A further aperture is cored for the tilt knob spindle, and, at the front, a circular aperture allows the entry of the lens tube into its housing in the chassis.

On the underside, several bosses are cast, three for securing the chassis, two for rubber feet at the rear, and four for a pressed base plate. Three cast-in bosses are also incorporated. These bosses are only brought into use in the "303" Automatic, where provision is made for remote focusing, the bosses being drilled and tapped to carry the remote focusing device.

At the front end, two rectangular pads are cast-in to form a fixed point for the carrying handle—also a die-casting, of standard design with a chromium plated finish.

The lid (Fig. 5) serves merely to cover, and provide access to, the assembly within. It has two dogs at its rear edge that locate around projections on the body, and around three sides a shallow register is provided to ensure alignment and make the assembly more light-tight. Above the fan, a further louvre is cast through the lid, giving additional venting, and two small bosses cast inside the lid provide attachments for a heat baffle that assists in keeping the top of the projector cool. In the casting shown, there is also a small cast-in hood to one side, above the position which the slide occupies. This allows a small beam of light to fall upon the slide about to be projected—a valuable aid when using the "Airequipt" automatic slide changer.

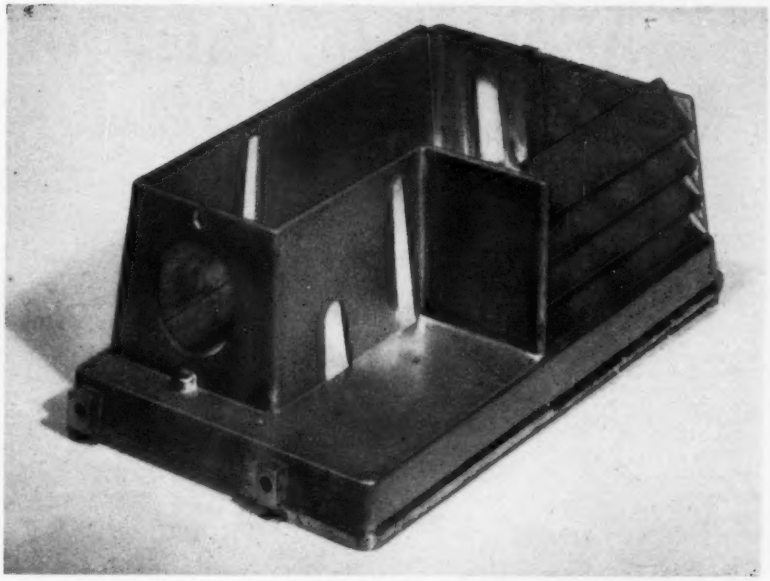


Fig. 4—The body : designed to meet the demands of current styling trends, encloses the optical and motor assemblies

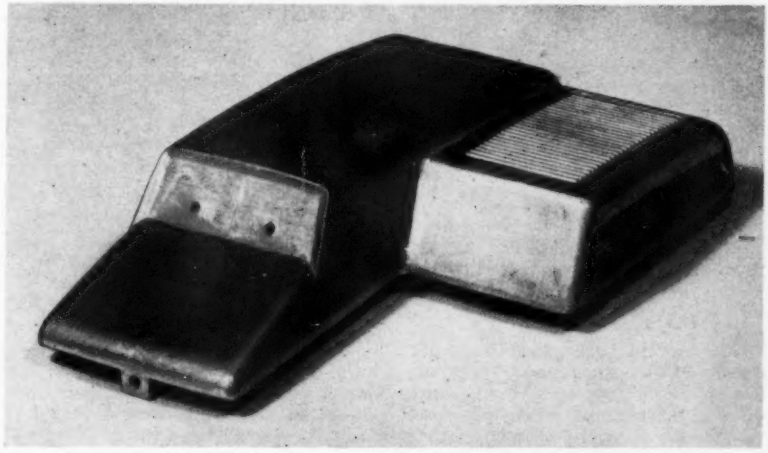


Fig. 5—The lid provides a readily removable cover for the assembly

While no true comparison can be made between this and previous models, because of the vastly different approach to the design problem, it may be of interest that the machining operations involved in the production of this one are some 30 per cent less than those for one of the previous models.

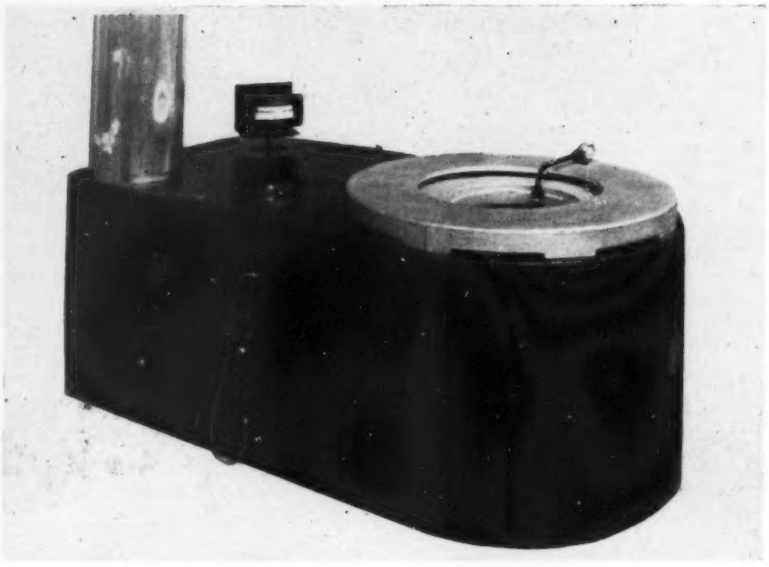
Third Die-Casting Conference

STRESA, in Northern Italy, is to be the town in which the Third International Pressure Die-Casting Conference is to be held. Opening on May 16, 1960, two days will be devoted to technical sessions and discussions. Twelve Papers will be presented. Two further days will be given over to visits to works, which will include both a trade die-caster and a plant tied to a manufacturer. Displays of die-castings and die-casting machines will also be arranged. The conference is being organized for the European Pressure Die Casting Committee by its Italian member, the Istituto Italiano del Piombo e dello Zinco, and registrations should be sent, before January 31, 1960, to the Italian secretariat. Forms of application and provisional programmes can be obtained from the Zinc Alloy Die Casters Association, 34 Berkeley Square, London, W.1. The conference fee is 37,000 lire (£21 sterling), payable in advance or on the opening day of the conference.

Aluminium Bale-Out Furnace

CONSIDERATION has been given recently by the Industrial Department of the West Midlands Gas Board to the design of bale-out settings normally used for melting and holding aluminium. Often, gas-fired units are inefficient in operation and do not present the best of conditions for the operator, who is in close proximity to the furnace throughout the whole of the working day. During the development of prototypes, therefore, particular attention has been paid to fuel consumption and comfort conditions for the operator.

In order to improve the overall efficiency, a recuperator has been included which utilizes the outgoing flue gases to preheat the air for combustion. The burner is of the air blast type using air at pressures of 14 to 20 in. w.g. The recuperator, together with the necessary gas governor, back pressure valve and motorised valves for temperature control, have been accommodated within the main casing, thus providing a neat and compact "packaged" unit ready for connecting to the appropriate gas and air supplies. With slight modification it would be possible to accommodate the fan unit within the main casing, although generally speaking, most die-casting shops have one or more blowing fans serving several holding pots.



In order to maintain a reasonably cool casing, a generous amount of insulation has been provided, and the flue is of the double wall type of construction providing an annulus for cold air to flow around the flue proper.

Two sizes have been constructed as prototypes, the first having a capacity of 150 lb. and the second a capacity of 300 lb. The 150 lb. size setting has been in extensive use in a large die-casting shop, and a comparison made with a similar sized electric unit shows that the running costs for holding with a small amount of melting are much lower for the gas-fired unit than for the electric unit.

Die-Casting Machines

A LINE of pressure die-casting machines for both cold-chamber and hot-chamber processes, having die locking pressures of 60 to 800 metric tons, are among the latest developments of the German firm of J. S. Fries Sohn, of Frankfurt/Main.

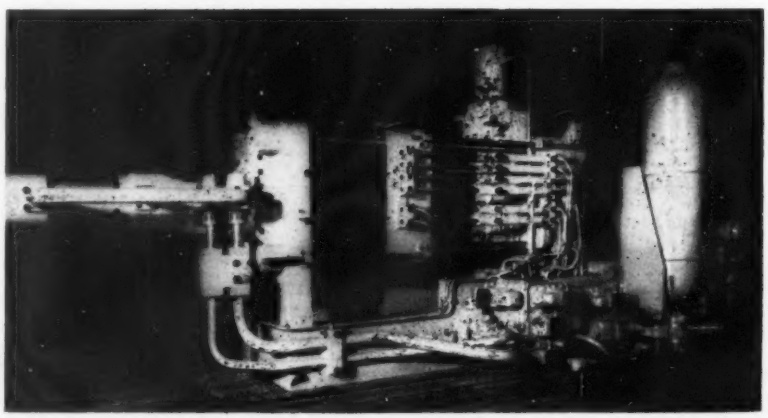
The 120-ton cold chamber machine, type FKM 120, like previous types, is equipped with a wedge locking system that provides safe, reliable and trouble-free operation—even under the most difficult conditions of continuous operation.

The injecting unit has been improved to give higher injection speeds, and injecting pressures and speeds may be exactly adjusted to suit specific requirements. The machine incorporates a pressure booster system, and special consideration has been given to the safety of operation of the electro-hydraulic control, and to the ease of accessibility of the pumps and distributing slide valves.

Additional automatic core-pulling combinations for cores inserted into one another out of the open or closed die have been provided. R-C elements instead of mechanical timing relays have been adopted.

By replacing the cold-chamber injection unit with the hot-chamber unit type FWM120—a work of a few hours only—the cold chamber machine FKM120 may be converted to a hot chamber machine to cast tin, zinc, and lead alloys. These hot chamber injection units incorporate an improved design of the original plunger gooseneck system already used in earlier types.

Instead of a bush shrunk in the gooseneck this system works with a short pressure ring and recuperator plunger, readily replaceable. The pressure ring, carried only on its plane surfaces, is not impaired by any heat distortion of the gooseneck, and gives extremely long service. An automatic temperature gauge and control device is fitted, and the pot is designed for easy removal.



Levelling in Bright Nickel Baths

By Dr. S. E. BEACOM and B. J. RILEY

(*Concluded from* METAL INDUSTRY, 4 *September*, 1959)

AUTORADIOGRAPHY was the primary source of information on the distribution of the radioactivity over the surface of the foil. Autoradiography makes use of the fact that the radiation from radioactive materials causes darkening of a photographic film much the same as light. The term *auto* indicates that the radioactivity is contained within the specimen that is being examined.

Since the S-35 gave off a very weak beta ray, it was considered necessary to have the foil in direct contact with the film. Therefore, most of the foils were mechanically flattened, placed between two pieces of film, and then weighted to ensure good contact. Past experience indicated that both chemical and pressure effects on the film could result from this method of exposure. To ensure that everything which appeared on the final autoradiogram was due to radioactivity and not to side effects, foils containing no radioactivity were exposed under identical conditions to check possible chemical interaction and the effects of pressure. These tests showed no influence of side effects. Although several types of film were used, the autoradiograms illustrated in this article were made on Type AA film.

Composite data on the counting and autoradiographic exposures (Table III), and representative autoradiograms of top and bottom surfaces (Fig. 5), revealed the location of radioactivity in the deposits. In addition to visual inspection, densitometric readings on a recording densitometer were made and were recorded below each autoradiogram (Fig. 5).

Most of the foils were mechanically flattened during autoradiography to obviate the differences in distance between the peaks and recesses and the film. Some of the foils were quite brittle, making the flattening process very difficult. Therefore, a check was made with a representative foil to determine if the mechanical flattening gave any advantage, either for the autoradiogram or for the subsequent densitometer trace (Fig. 6).

With the data obtained and the observations made, it was possible to draw some conclusions about the phenomenon being considered.

Confirmation of Levelling Theory

An examination of the autoradiograms (Fig. 5) shows a greater darkening on those portions of the film which were irradiated by the peaks of the foils. In those autoradiograms labelled "Top," the difference in density of the lines produced by peaks and recesses is evident, but there is also present a greater smearing of radioactivity than is apparent on the corresponding "Bottom" autoradiograms. The concentration of activity in both instances, however, is much higher on the peaks than in the recesses. This is especially true with the "Bottom" autoradiograms, which show that the activity is concentrated on the obverse of the "Top" peaks. This differential darkening of the films means that there is greater radioactivity emanating from the peaks than from the recesses.

The slit counting data for radioactivity on the peaks and in the recesses (Table II) serve as quantitative confirmation of the results shown visually by the autoradiograms. Likewise, the densitometer traces made from the autoradiograms show quantitatively the distribution of radioactivity over the entire surface. The concentration of activity is highest on the peaks of the "Top" autoradiograms and on the obverse of the peaks on the "Bottom" autoradiograms. These traces also indicate the manner in which radioactivity increases from a minimum at the bottom of a recess to the maximum at a peak.

In explanation of these results, it is apparent that the ratio of radioactive material (sodium allyl sulphonate or a reduction product containing the S-35) to deposited metal is greater on the peaks than in the recesses. Consequently, there is less self-absorption of the radioactivity by the thinner nickel metal on the peaks and, therefore, a greater darkening of the film occurs. This explanation is consistent with the fact that in levelling, less metal is deposited on the peaks and more metal is deposited in the recesses of an irregular surface. In order to initiate the levelling process, the addition agent first must be concentrated preferentially on the peaks.

The autoradiograms and the slit counting data appear to confirm the assumption of a preferential adsorption or co-deposition of the addition agent on the peaks. Actually, these results, as well as those recorded in the literature, show only that the agent is concentrated at the peak area. The mechanism of this concentrating action, possibly a chemi-sorption cataphoretic phenomenon, has not yet been demonstrated satisfactorily. While some investigators[7,14] have shown that certain addition agents are apparently deposited with the metal in an unchanged or un-reduced state, the work of Hoekstra[18] and Vanderkooi[15] strongly

TABLE III—COUNTING DATA AND AUTORADIOGRAPHY

Foil No.	counts/min/cm²	Type of Film	Exposure Time (hr.)	Results		
				Image	Detail	Background
21	T-12*	KK	833	Fair	Poor	Heavy
	B-10*	KK	833	Fair	Poor	Heavy
25	T-22	KK	833	Good	Fair	Heavy
	B-30	KK	833	Good	Fair	Heavy
26	T-15	KK	1268	Poor	Poor	Heavy
	B-13	KK	1268	Poor	Poor	Heavy
31	T-1830	K	22	Good	Fair	Heavy
		AA	67	Good	Good	Light
	B-2320	K	22	Good	Good	Heavy
		AA	67	Excellent	Excellent	Light
34	T-850	AA	141	Good	Fair	Light
	B-895	AA	141	Excellent	Good	Light
36	—	AA	66	Good	Good	Light
	B-2231	AA	66	Good	Good	Light
38	T-901	KK	18	Fair	Fair	Heavy
		AA	48	Good	Good	Light
		AA	146	Excellent	Excellent	Light
	B-2116	KK	18	Good	Good	Heavy
		AA	48	Good	Good	Light
		AA	67	Excellent	Excellent	Light
41	T-736	AA	67	Poor	Poor	Light
	B-1656	AA	67	Good	Fair	Light
51	T-585	AA	67	Excellent	Excellent	Light
	B-1434	AA	67	Excellent	Excellent	Light
54	T-804	AA	67	Good	Good	Light
	B-1221	AA	67	Excellent	Excellent	Light

**T—top of foil; B—bottom of foil.*
Film Processing Conditions: Temperature, 19°-20°C. *Development time,* 4-6 *min. Developed emulsions on both sides of film.*

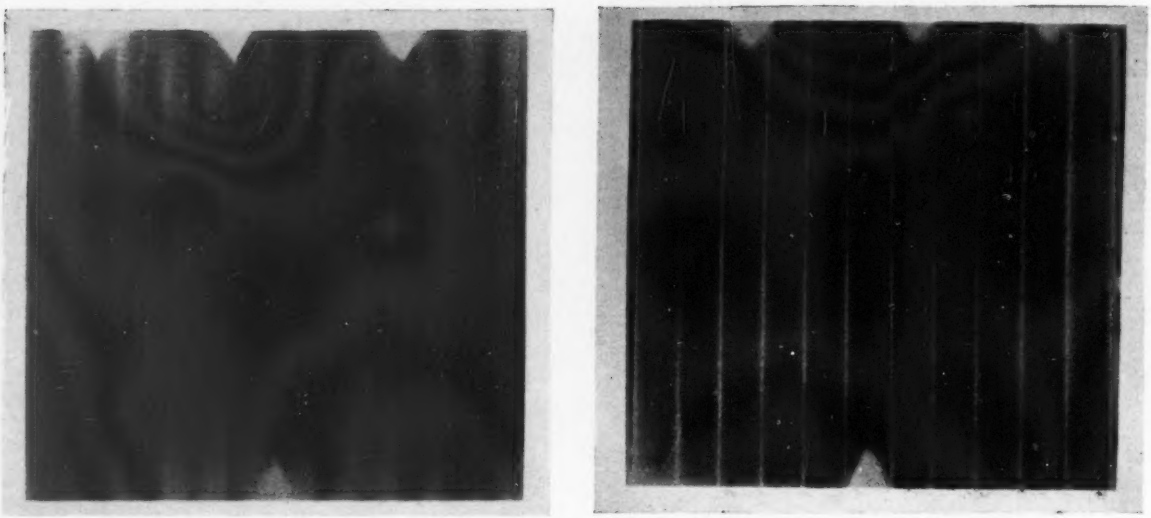
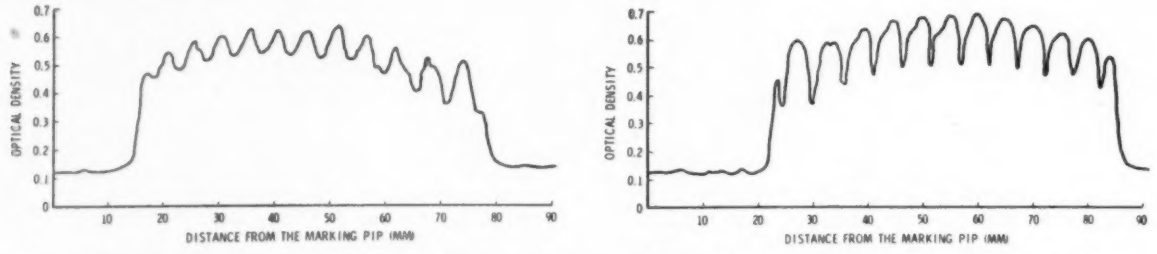


Fig. 5—Representative autoradiograms of the Top (left) and Bottom (right) of a foil are shown here. These reproductions are positives which are identical with the original autoradiograms. The dark areas indicate the regions of the foils which contain radioactivity. Since it was necessary to make an intermediate negative to achieve this reproduction, some detail has been sacrificed. All of the notches or holes cut into the foils and visible in the autoradiograms were cut for identification purposes. This system of notching not only allowed identification of the individual foils, but also precisely located the peaks and recesses on a given foil. Since the recording densitometer produced a marking pip each 0·5 millimetre, it was possible, by placing a mark near the edge of the autoradiogram, to make an accurate measure of the distances from the edge. By calibrating the instrument prior to use with a standard step wedge, the densities recorded were the actual densities from exposure to radioactivity when all possible variables in film processing were kept constant



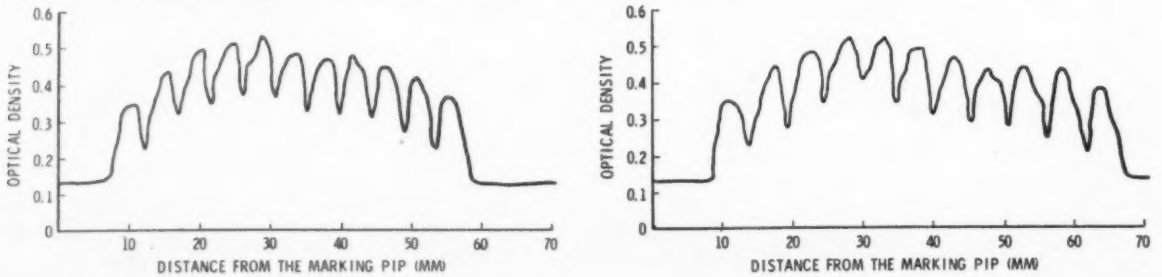
indicates, in the case of sodium allyl sulphonate, that its reduction product, sulphide ion, is present in the electrodeposited nickel metal. The present work, with this same addition agent, shows only that the labelled S-35 atom is located in the deposit, since no attempt was made to distinguish between the possible presence of the sulphonate or the sulphide.

With the type of bath employed in this study, the levelling process is accompanied by the formation of laminations[2,4,6,9,11,15,18,19], which appear as light and dark bands. Several investigators[6,15,18] have speculated that the dark bands contain sulphur, probably in the form of sulphide. It has been proposed by Vanderkooi[15] that the dark bands are formed by the reaction between nickel and the reduction product of the sodium allyl sulphonate, while the light bands are nickel. In order to account for the formation of these laminations as they accompany the levelling process, it is convenient to assume that both phenomena start with a preferential adsorption of the addition agent on the peaks. It would appear (from an inspection of Fig. 3) that the formation of the laminations is some type of cyclic process, wherein alternate layers of metal, and the addition agent or its reduction product, are deposited. The start of this cyclic process and the inhibition of metal deposition on the peaks can be explained by an assumption of preferential adsorption of addition agent.

Reference

19 K. M. Gorbunova, I. V. Ivanovskaya and N. A. Shishakov; *Zhurnal Fizicheskoi Khimii*, 1951, **25**, 981 (Insdoc Translation No. 1172).

Fig. 6—To determine whether the mechanical flattening of a foil had any significant effect on its autoradiogram, a comparative test was run on a foil. After removal from the cathode, an autoradiogram was made from a foil. The foil was then flattened and another autoradiogram obtained on the same type of film exposed for the same length of time and under the same conditions. The densitometer traces of the autoradiograms before (left) and after (right) the foil was flattened indicated that there was no advantage in mechanically flattening the foil. There were no significant differences between the autoradiograms.



Industrial News *Home and Overseas*

Electronic Programme Control

Advances made in electronic machine tool control systems and other automation aids are being demonstrated by **E.M.I. Electronics Ltd.** with a new demonstration unit which has left for Paris. The French capital—venue for the Machine Tool Exhibition which opens to-morrow—is the first stopping place for the unit, a 25 ft. trailer powered by a special 105 h.p. Rootes Diesel. Later, main industrial centres in Belgium, Holland, Germany, Switzerland and Italy will be visited.

The trailer has been fitted out as a complete modern workshop. There is a programmer's office where punched tape is prepared to produce any type of workpiece, from a simple two-dimensional template to a three-dimensional die.

Protecting Silver from Tarnish

For the protection of silver against tarnish the **Roto-Finish** Argalin treatment has been approved by the Ministry of Supply under D.T.D.900 and given the reference "D.T.D.900/4636."

Argalin is a simple electrolytic treatment consisting of immersion from between 1 and 2 min. in the Argalin solution, followed by rinsing and drying. The standard test to determine the efficiency of the Argalin coating is immersing for half an hour in 2 per cent potassium sulphide solution, without any appreciable change in appearance. Silver plated articles immersed in this solution usually show evidence of considerable tarnish in less than a minute.

This treatment, used for such products as silver-plated cutlery and decorative silver ware, and also for electrical contacts, ensures that the silver plated surface remains bright during storage and transport.

Lead Bricks

For use in shielding personnel against gamma, beta and alpha rays, a new lead brick has been produced by a special "pressure moulding" by **British Lead Mills Ltd.**, a member of the Firth Cleveland group. After a period of close liaison with the U.K.A.E.A., Harwell, a pressure-moulded lead brick was produced and accepted by Harwell as a standard for all future requirements. Pressure moulding ensures the greatest density and freedom from porosity and inclusions within the fine limits permissible under Harwell's very rigid specification.

The B.L.M. pressure-moulded lead bricks are produced in 2 in. and 4 in. thicknesses in the form of standard, corner, top and bottom bricks, and also half, or even quarter, bricks which can be built up into a complete surround by virtue of their interlocking nature, to give the maximum thickness at any point of 2 in. or 4 in., or multiples thereof.

Welding Research

Some changes are being made in those departments of the **British Welding Research Association** in direct contact with members of the association. A new members' service department is combining the functions of the old liaison and publications departments.

Head of the new department is Mr. P. H. R. Lane, B.Sc., A.I.M., until recently deputy chief metallurgist of the association. Mr. R. G. Burt, O.B.E., B.Sc., M.I.Mech.E., hitherto chief development officer, remains with the association as development consultant, and Mr. L. Parkes has taken over as editor for reports and publications, including the two cover-to-cover translations of Russian monthly welding journals undertaken by the association. An appointment will shortly be announced of a senior officer as head of a design section in the new department.

Lecture Courses

A course of ten lectures on Absorption Spectroscopy is to be held on Friday evenings from 6 to 7 p.m., beginning on October 9 next, at the **Sir John Cass College,** in London. The subject will be treated mainly with reference to the practical problems of the chemist, and the lectures will be illustrated by lantern slides, photographs, charts, demonstrations, etc. The fee for the course is £1.

A course of twelve lectures on Spectrochemical Analysis has also been arranged by the College, for Wednesday evenings beginning on September 30 next at 6 p.m. The fee for this course is £1.

On Tuesday evenings, from 6.30 p.m. to 8.30 p.m., a course of eight lectures on Radioactive Isotopes in Metallurgy and Ceramics is to be held, commencing on October 13 next. The fee for this course is also £1.

Full details of these courses and application forms may be obtained from the Secretary to the College at Jewry Street, Aldgate, London, E.C.3.

Annual Dinner

Dorchester Hotel, London, is to be the venue of the annual dinner of the **Institution of Production Engineers,** which is being held this year on Thursday, November 19.

Aluminium Drawbridge

What is believed to be the first canal drawbridge of all-aluminium construction was recently installed to replace a 60-years'-old wooden structure over the Birmingham-Oxford canal at Banbury. The new bridge was designed by **Northern Aluminium Company** to carry the Ministry of Transport standard load. The bridge is 10 ft. wide, with a clear span of 9 ft. 6 in. to concrete abutments, and utilizes about 1,700 lb. of aluminium sheet, plate and extrusions in Noral B51SWP (BSH30WP) alloy, fastenings being aluminium alloy rivets and mild steel bolts.

Bronze Bearings for Brazil

Formation of Johnson Bronze do Brasil, with manufacturing facilities in Rio de Janeiro, has been announced by the Johnson Bronze Company. The new company results from a merger of Johnson Bronze International Incorporated and the partners of Sinte Rosa Auto Pecas Ltda. Johnson Bronze do Brasil will succeed to the business of Sinte Rosa, and will produce sleeve bearings for the rapidly expanding automobile industry in Brazil.

In addition to its two plants in New Castle, Johnson Bronze has an Oakland, California, subsidiary, and serves customers in 61 foreign countries as well as the United States.

International Tin Council

At a press conference held in London last week, Mr. George Peter, chairman of the International Tin Council, said that the Technical Committee of the Council has begun working on a new draft tin agreement to replace the present one that expires on June 30, 1961. The new draft agreement will be submitted to the Council at its next meeting in December and to the United Nations in May next year.

Now that the trade estimate the buffer stock to be reduced to around 10,000 tons, there is much interest in the interpretation by the Council of Articles 7 and 11 of the agreement which set certain conditions on the amount of tin held in the buffer stock, and its liquidation.

Mr. Peter told the press conference that he was not permitted to make any statement on this matter but Article 7 states that in fixing the total permissible export amount the Council shall "aim to maintain available in the buffer stock, tin and cash adequate to rectify any discrepancy between supply and demand which may arise through unforeseen circumstances." The Article goes on to say that no export quota shall become effective unless at least 10,000 tons of tin is held in the buffer stock.

At this stage in the agreement, traders argue, Article 7 could be superseded by Article 11, which states "during the period of two years ending with the date of termination of this agreement, the Council, when fixing the total permissible export amount for any control period shall pay due regard to the need for reducing the quantity of tin held in the buffer stock by the date of termination." The Article also states that in the same period the manager may sell from the buffer stock at any price not less than the floor price the extra quantities of tin by which the Council may reduce export quotas. Mr. Peter explained that the Council were of the opinion that to clarify these points would affect the market, and he was instructed to remain silent.

Agreement with U.S. Company

It has been announced by **Alfred Bullows and Sons Ltd.** that they have made an agreement with the Gray Company Inc., of Minneapolis, U.S.A., whereby they have sole distribution rights in the United Kingdom for the complete range of Fraco industrial equipment. This equipment includes, under main headings, Hydra-spray airless spray painting equipment, heavy material spray and extrusion equipment, and fluid transfer equipment of all types.

Plastics Aluminium

A new addition to the range of Devcon plastics metal products is a plastics aluminium designed specifically for applications requiring an aluminium material of liquid consistency. Tough enough when hardened to withstand sledge hammer blows, it has many uses, including making foundry patterns, core boxes, plastics sign

moulds, jigs, repairing fabricated aluminium parts, and filling large holes in ferrous and non-ferrous castings.

This plastics aluminium, known as Devcon F.2 and distributed here by **E. P. Barrus (Concessionaires) Ltd.**, contains 80 per cent aluminium and 20 per cent plastics. Applied in liquid form by brush or poured on to surfaces to be treated, it bonds to iron, steel, bronze, brass, glass, concrete and other materials.

Devcon F.2 hardens in 1½-2 hr. at 70°-75°F. to form a rigid, metallic mass. No volatile solvents or thinners are used, so that it will not shrink or pull away during hardening. No heat or pressure is needed to apply F.2, which is unaffected by normal anodizing solutions. It is stated that this product can be drilled, ground, sanded or threaded, and machined to a feather edge without cracking or flaking. A highly polished finish can be obtained. For standard painting plastics aluminium, it is said, will not bubble, shrink or run at normal baking temperatures.

Moving to London

News from the **Institute of British Foundrymen** is to the effect that the head office of the institute is to be transferred from Manchester to London. The removal will be effected by November 13 next, and from that date the address of the institute will be 14 Pall Mall, London, S.W.1, and the telephone number will be Whitehall 7141-2.

U.K. Metal Stocks

Stocks of refined tin in London Metal Exchange warehouses at the end of last week fell 424 to 7,829 tons, comprising London 4,549, Liverpool 3,120, and Hull 160 tons. Copper stocks fell 1,031 to 14,963 tons, and comprised London 2,997, Liverpool 6,141, Birmingham 425, Manchester 5,400 tons, and Swansea nil.

Italian Scrap Copper

According to the Central Statistical Institute, Rome, in the seven months of 1959 Italy imported 3,079·8 metric tons of scrap copper, compared with 3,418·7 in the similar 1958 period.

Indian Copper Mining

It is reported from New Delhi that preliminary discussions have taken place with the Polish authorities regarding their general offer of assistance in the development of copper mining in India.

A New Address

We are advised by **British Insulated Callender's Cables Ltd.** that, as from Monday, September 28, the address of their Northampton depot will be 18-22 St. George's Street, Northampton.

Die-Casting Machine

At the 6th European Machine Tool Exhibition in Paris, new developments in their range of pressure die-casting machines are being shown by **J. S. Fries Sohn,** of Frankfurt/Main, West Germany. Also being shown is a gravity die-casting machine of horizontal design.

This is a most interesting development. Of horizontal design, the opening, closing and core pulling motions of the machine are effected by means of an oil-hydraulic system. A mechanical ejector device is provided to eject the castings. The complete machine frame may be swivelled at random and locked by stocks located 30° apart from each other. The machine is illustrated on this page.

Dust Arresters

Whiting wet dust arresters are the result of more than 25 years of development and practical application of the principle of arresting dust with water. These units are provided by **The Incandescent Heat Company Ltd.,** and full details of features of these Incandescent Whiting arresters are given in a foundry leaflet recently issued by the company. A number of photographs of these units, which have been installed in various British works, are included.

Small Bore Cylinders

To meet the ever-increasing demand for a robust, small bore cylinder of light construction, **Baldwin Industrial Controls** have introduced three new basic cylinders to their range. Bore sizes are ¾ in., 1 in. and 1½ in., with strokes ranging from 1 in. in the ¾ in. bore size to 10 in. in the 1½ in. bore. Cylinders can be either double-acting or single-acting with spring return.

These cylinders have been designed primarily for light holding, clamping, or similar jobs where small physical size combined with rugged construction are first considerations. Maximum air pressure is 150 lb/in², delivery is ex stock and prices range from 19s. 6d. each.

Developments at Holman Group

At the headquarters of the Holman Group in Camborne, Cornwall, a new Metallurgical Control and Heat Treatment Department has been built and equipped. This Group have to meet ever-growing demands for machines with increased power and reduced weight, and, in maintaining the highest standards of reliability and quality, metallurgical control assumes very great importance and heat-treatment becomes one of the vital processes in production. Holman Brothers Limited, following integration with Climax Rock Drill and Engineering Ltd., have underlined the value of this part of their production by the construction of this completely up-to-date department, which will also be used by the other members of the Group, Maxam Power Ltd., Goodyear Pumps Ltd., and Dustuctor Co. Ltd.

The department, with a floor area of 17,000 ft², contains metallurgical, physical and chemical laboratories, and high speed, tool steel, piston and general heat-treatment sections. Equipment used in the department includes Birlec, G.E.C., and Efco batch type furnaces, Birlec forced air circulating tempering furnaces, Birlec-Cassel salt bath furnaces, and shorterizing equipment; Wild-Barfield drip-feed gas carburizers, Efco salt bath furnaces, Birlec 110 kW pack carburizing furnaces, and various types of oil quenching machinery. Spenstead rotary shot blast equipment is used for general shot blasting operations. Hardness and other tests are carried out in the inspection section, through which all finished heat-treated work passes. Hardness testing equipment used includes Brinell, Rockwell, Vickers and Shore scleroscopes.

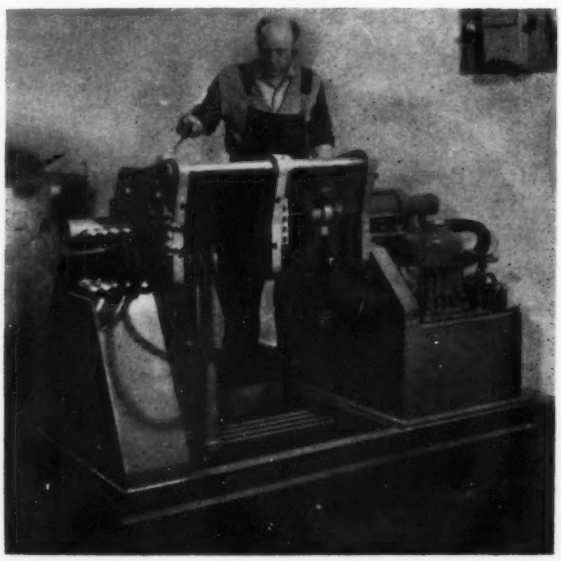
Firth Cleveland in U.S.A.

A new company to represent the **Firth Cleveland** group in the United States has been formed in New York. Known as Firth Cleveland Incorporated, this company is to have a subsidiary with the title of Surform Incorporated, which will be responsible for the distribution of Surform and Surcut hand tools in the U.S.A.

Wiggin Exhibitions

A four-day exhibition illustrating the properties and use of nickel and its alloys will be presented by **Henry Wiggin and Company Ltd.** at the Imperial Hotel, Birmingham, from October 6 to 9 next. The exhibition will include displays featuring the varied special properties of the Wiggin alloys—heat-resistance, corrosion-resistance, electrical-resistance, and special physical properties.

These displays will be supported by over 350 examples of components, each of which uses one or more of the alloys covering power, transport, chemical engineering, industrial heating, industrial and domestic electrical equipment, and electronics. The exhibition will be augmented by a series of lectures and the continuous



Gravity die-casting machine by J. S. Fries Sohn

showing of films dealing with the use of Wiggin alloys to answer the many problems met in modern industry.

During the following week, from October 12 to 15, the exhibition will be presented at the Midland Hotel, Manchester, and at both these events members of the company's technical service staff will be available to deal with enquiries.

The Wolf Orbital Sander

Based on the findings of extensive market research, **Wolf Electric Tools Ltd.** have recently introduced the "Sandswift" orbital sander, which incorporates a number of special features. These include (1) low weight, it weighs only 7 lb. 3 oz.; (2) continuously rated motor—the motor is based on the most popular power unit; (3) sanding to fine limits—the operator, it is said, can work up close to skirting boards, frames, etc., without damage as the orbit area of pad is $\frac{1}{16}$ in. less than body frame. The unit can be placed safely on its side without waiting for the pad to come to a standstill after switching off; (4) quick change sanding sheets—sprocket type of paper locking mechanism is fitted, making it quick and easy for the operator and giving a positive automatic paper tension; (5) preferred pad size—the company considers that most operators prefer the $3\frac{1}{4}$ in. by $7\frac{1}{8}$ in. pad for convenience of use and satisfactory results; and (6) full range of standard equipment—the "Sandswift" is supplied complete with 10 ft. of 3-core T.R.S. cable, hexagon key for pad removal, sponge rubber pad, and fine, medium and coarse aluminous oxide open coat sanding sheets.

Industrial Electric Heating

Speaking at Buxton this week during a two-week course on Electro-Technology for engineers of the **National Industrial Fuel Efficiency Service,** Mr. J. T. Sharples, B.Sc., A.M.I.E.E., said that electricity was the only form of energy which does not require oxygen in some form or another for its conversion into heat, and does not produce any products of combustion. This, he said, not only means a saving in building costs arising from an absence of flues and chimneys, but also the avoidance of any contamination of the product being heated.

The vitreous enamelling process, continued Mr. Sharples, might be cited as one in which the quality of the product was playing an increasingly important part when it came to deciding what method of heating was to be employed in firing the enamel frit. There was little doubt that, at present, an oil-fired, or even a gas-fired, furnace could be operated more cheaply than an equivalent electric furnace if one considered only the fuel cost. But fuel-fired furnaces incorporated a thick refractory muffle to keep the products of combustion away from the enamel, which would be affected by them. A compromise had to be made between the thickness of the muffle and the size and cost of the furnace, and in practice no muffle could be guaranteed to give 100 per cent protection against contamination. A case could be quoted where a manufacturer of kitchen ranges, using a gas-fired furnace, had to have a close inspection process for enamelled components so that reasonable colour matching could be effected in the final assembly, but this process was entirely eliminated when a change was made to an electric furnace.

Mr. Sharples mentioned the case of a metal working factory which was considering the installation of a small electric infra-red oven for paint stoving, but was deterred by a consideration of its running cost, based on the existing average cost of electricity per unit, as compared with a gas-fired convection oven. As the factory demand was occasioned mainly by some air compressors, presses and the like, and occurred when these were first switched on in the morning, it was pointed out that it would be a simple matter for this demand to take place before switching on the infra-red oven, which would, of course, be ready for use within a few minutes. Moreover, it was found that the factory was to install other machines which could be treated in the same way. Calculations based on the expected diversity in the use of electricity and including the proposed new machine, showed that the steady consumption of the oven with its relatively low contribution to maximum demand, would reduce the average charge per unit by about 30 per cent. This example showed that electricity supply was unique in having a price structure based largely on load factor.

Space Heating

At the same meeting at Buxton, Mr. E. M. Ackery, B.Sc., said that in considering the advantages of using electricity for a space heating scheme, there is an intangible item which might be called the general amenity value of electricity—complete cleanliness, both internal and external. In this connection, it was interesting to note that the Ministry of Education are prepared to make an allowance of about 10 per cent on the total running costs on this score in favour of electricity. In other words, they are prepared to recommend the acceptance of an electrical heating scheme if the total annual running cost is not more than 10 per cent in excess of that of a fuel fired system.

In the course of time, said Mr. Ackery, almost every conceivable method of heating a room or providing comfort for the occupants had been tried. These methods varied from pure convective heating, as in the case of the room heated by warm air supplied through ducts, to heating with high temperature sources which gave a high proportion of radiation and relatively little convection. None of the many methods had ever found universal acceptance, and most of them were in use to-day. Electricity could, however, cover the complete range from the electric air heater battery to the high temperature radiant, or, as it was sometimes called, the infra-red heater.

Mr. Ackery said that there were many cases in industry of large spaces which were very sparsely occupied, spaces that were often very lofty and not of particularly well-insulated construction. In most of such spaces heat was required for the sake of the people in them, as apart from this there was no reason why they should be heated. It was, however, possible to provide some measure of comfort for the operatives without heating the whole of the space by using high temperature electric infra-red overhead heaters directed on to the places where the operatives worked. By this means a reasonable degree of comfort could be provided with far less expenditure of heat than would be required to heat up the whole of the building.

Products and Services

A most interesting book of 68 pages has recently been distributed by the **Thos. W. Ward Ltd.** group of companies, in which is set out in attractive text and coloured photographs, maps, etc., details of the very wide range of products and services in which this group is most active. The book opens with a map, in colours, showing the location of the offices, works and other installations of the group of companies and its associates.

In the pages which follow, details are given of the various types of contractor's plant available, including such machinery as tractors, conveyors, cranes of all types, also a wide range of machinery for all purposes. Boilers and tanks, road building materials, iron and steel products, scrap iron and steel and raw materials, non-ferrous metals, and foundry supplies, also all have pages devoted to them. Many of the photographs are in colour and the whole work is produced in such a way as to hold the reader's attention right to the end.

Men and Metals

Holder of the University of London Chair of Mining Geology at the Imperial College of Science and Technology, **Professor David Williams,** D.Sc., Ph.D., B.Eng., D.I.C., has been elected President of the Institution of Mining and Metallurgy for 1960-61. He was elected to Associate Membership of the Institution in 1932, to full membership in 1941, and has served on the Council since 1949, holding office as vice-president from 1954 to 1957.

It is announced that **Captain Robert Alexander Villiers,** C.B.E., A.M.I.E.E., R.N. (Retd.), has been appointed Director of the Scientific Manufacturers' Association of Great Britain.

Just appointed general sales manager of Croda Limited, **Mr. N. R. Kirkby** is to make a tour of the company's continental associates next month. Mr. Kirkby, who joined the company 20 years ago, has for the past few years been the company's chief technical representative in the Sheffield area. He is being succeeded in that area by **Mr. R. J. Seddon.**

A director of T. C. Jones and Company Limited (a member of the Cohen 600 Group), **Mr. S. C. Harris** is being installed to-day as President of the South Wales and Monmouthshire branch of the Incorporated Sales Managers' Association.

Research director of Ferodo Limited, **Dr. R. C. Parker** has left by air for a three weeks' visit to the U.S.A. During this period he will hold technical discussions with the S. K. Wellman Company, in collaboration with whom Ferodo is manufacturing sintered metal products in the U.K., and the Bendix Aviation Corporation, with whom Ferodo exchanges technical information on the development of ceremetallic friction materials.

Metal Market News

NO spectacular developments occurred in copper last week, and after a mild advance during the first three days, Thursday found the settlement price unchanged from the previous Friday, although three months had risen by 10s. to £234 5s. 0d. The mood of the market appeared to be one of resignation to the copper strike, which certainly shows no sign of coming to an end. Indeed, it seems to be set for a really long run, and the fact that American Labor Day has come and gone without a settlement being reached prompts the conclusion that we shall be lucky to have the men back at work by the end of September. Stocks of copper were reported higher again at the beginning of last week, the total being up by 266 tons at 15,994 tons. In view of the sales that are understood to have been made to the States this trend is rather surprising, but before we are much older a downward movement in the stock figure may set in. The week opened up with a backwardation of £2 10s. 0d., but matters improved steadily and by Thursday afternoon this had narrowed to 25s., mainly, perhaps, because of a decline in buying interest from the United States. Moreover, the Longshoremen's strike, likely if it comes to affect all the Eastern seaboard of the North American continent, is still a distinct possibility, with a deadline on timing of October 1. On the last day of August, custom smelters returned to the market on a basis of 33 cents, after being absent from the scene for some three weeks. Apparently a modest business was put through at this level, but there does not seem to have been any rush to buy. Nevertheless, dealers are able to secure 33¼ cents for a fair tonnage.

At a meeting of the International Tin Council last week it was decided to raise the permissible exports of tin in the fourth quarter of this year for the six exporting members of the Tin Agreement to 30,000 tons, or 5,000 tons more than the present quarter. It looks as though the mines will be able to operate at about 80 per cent of capacity and the producers are naturally pleased about this relatively generous increase which compared with only 2,000 tons in the period July to September. Rather surprisingly, the market on Friday took the news equably, being no more than 10s. lower at Friday midday. In the afternoon, the cash price improved sharply to £793 10s. 0d. On the week, after a turnover of nearly 700 tons, cash closed 10s. up at £793 10s. 0d. and three months £1 down at £792. Copper was, on the whole, a very steady market, but after the American custom smelters had reappeared as sellers at 33 cents on the last day of August, the quotation for standard copper advanced to £238 5s. 0d. cash and £235 15s. 0d. three months on September 1. Thereafter, values eased somewhat to finish at £236 cash, 15s. down, and £234 15s. 0d. three months, 5s. up on a turnover for the week of 11,000 tons.

On the whole, consumer business was moderately good last week, but there was still no scramble to buy. It is currently reported that a very considerable tonnage of electrolytic has been sold to the United States from Europe and the position now is apparently that there is very little, if any, space left on steamers to New York. This may well mean that sales to the United States may languish, especially as there are fears of a longshoremen's strike on October 1. Business in zinc and lead was not very brisk, the turnover in the former amounting to about 5,400 tons. On balance, after some fluctuations, September closed 5s. down at £86 5s. 0d., while December was unchanged at £85. Consumer demand in the U.K. is only moderately good. In lead, some 4,100 tons changed hands, both positions being slightly easier on balance. At £72, September closed 5s. down, while December, at £73 5s. 0d., lost 10s. Both these metals continue to move within narrow limits and there is no special feature.

New York

Commodity Exchange copper was very steady on week-end covering, aided by a firmer undertone in dealer copper. Dealers said that better consumer demand was noted to-day. Sales at up to 33½ cents were reported. The American Metal Climax Company reported further sales at 33 cents per lb. Lead was quiet. Zinc continued active in Prime Western and high and special high grades. Tin was quiet and steady. In late trading tin continued quiet and steady. Copper, lead and zinc were unchanged.

Negotiations are continuing at American Brass between the Anaconda subsidiary and the Mine Mill Workers' Union. No negotiations are taking place between the unions and copper companies whose workers are on strike, and with the American Smelting and Refining Company. The tin market was weaker and quiet, reflecting the increase in the export quota for the fourth quarter by the International Tin Council. Traders said buyers backed away from the market after the Tin Council statement.

It is reported that the United States Tariff Commission have instituted an investigation under the "Escape Clause" procedure into imports of zinc sheets (including coated or plated sheets), classifiable under paragraph 394 of the Tariff Act of 1930. The application filed in this case is available for public inspection at the office of the Secretary, United States Tariff Commission, 8th and E. Streets, N.W. Washington, D.C., and at the New York City office of the Tariff Commission, located in Room 437 of the Custom House, where it may be read and copied by persons interested.

A public hearing will begin at 10 a.m. on November 3 in the Hearing Room, Tariff Commission Building.

Exporters are advised to ensure that their importers are represented at the above hearing, but if for any reason this is impossible, it is desirable that the exporter should submit direct to the Commission any information having a bearing on the investigation.

Birmingham

Although latest figures of unemployment show an increase, this is due to the influx of school-leavers on the unemployment registers. It does not mean that trade conditions have worsened. On the contrary, the improvement in industry in the Midland area is gathering strength, and the outlook is favourable for the rest of the year. Good news comes from the cycle industry, where production is expanding after falling steadily from its peak in 1955. The trade was assisted by the lowering of the purchase tax earlier in the year, and other reasons for improvement are the fine summer and the general recovery of the industrial position. Orders for electrical goods for household use are increasing.

Sheet steel makers are working to capacity to supply the ever-growing needs of the motor trade and those industries connected with it. The outlook for iron and steel generally is better than it has been at any time this year. Building is again active, and there are more contracts for heavy joists and sections. Foundries continue well employed on work for the engineering industries. Supplies of pig iron are available to meet any expansion that may occur. Re-rolling mills are well employed on orders for light sections, bars and strip. Imports are at a low ebb now that semi-finished steel is available from English and Welsh mills.

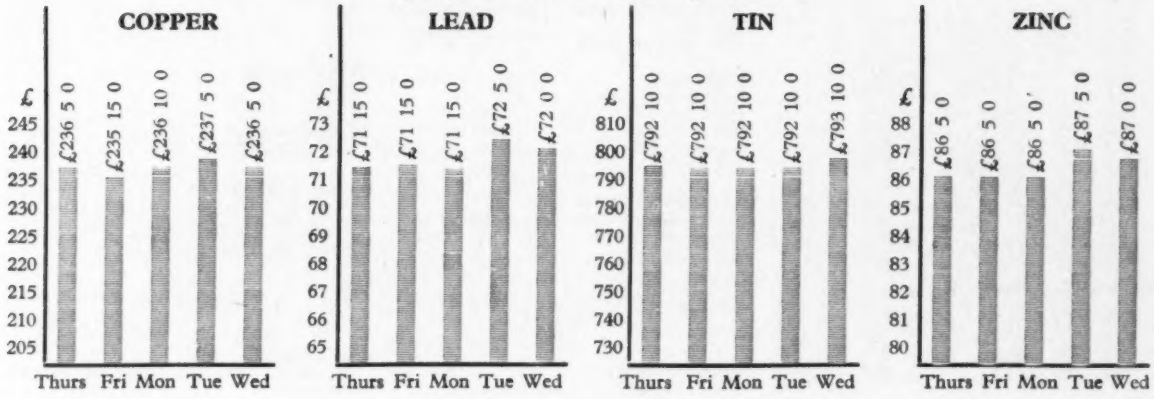
Western Germany

West Germany's aluminium production in July, at 14,135 tons, was the highest this year and compares with 13,741 tons in June, according to official statistics. Production in the first seven months of this year, at 82,346 tons, was 1·9 per cent higher than in the corresponding period of 1958. The aluminium works' annual capacity of 160,000 tons is now used to a great extent. The production of semi-manufactured aluminium goods in the first seven months of this year, at 102,286 tons, was 7·6 per cent higher than in the corresponding period of 1958.

Non-Ferrous Metal Prices

London Metal Exchange

Thursday 3 September to Wednesday 9 September 1959



Primary Metals

All prices quoted are those available at 2 p.m. 9/9/59

		£	s.	d.
Aluminium Ingots	ton	180	0	0
Antimony 99·6%	„	197	0	0
Antimony Metal 99%	„	190	0	0
Antimony Oxide	„	180	0	0
Antimony Sulphide Lump	„	190	0	0
Antimony Sulphide Black Powder	„	205	0	0
Arsenic	„	400	0	0
Bismuth 99·95%	lb.		16	0
Cadmium 99·9%	„		9	0
Calcium	„	2	0	0
Cerium 99%	„	16	0	0
Chromium	„		6	11
Cobalt	„		14	0
Columbite per unit			—	
Copper H.C. Electro	ton	236	5	0
Fire Refined 99·70%	„	235	0	0
Fire Refined 99·50%	„	234	0	0

		£	s.	d.
Copper Sulphate	ton	76	0	0
Germanium	grm.		—	
Gold	oz.	12	10	7½
Indium	„		10	0
Iridium	„	24	0	0
Lanthanum	grm.		15	0
Lead English	ton	72	0	0
Magnesium Ingots	lb.		2	3
Notched Bar	„		2	9½
Powder Grade 4	„		6	1
Alloy Ingot, A8 or AZ91	„		2	4
Manganese Metal	ton	245	0	0
Mercury	flask	71	10	0
Molybdenum	lb.	1	10	0
Nickel	ton	600	0	0
F. Shot	lb.		5	5
F. Ingot	„		5	6
Osmium	oz.		nom.	
Osmiridium	„		nom.	

		£	s.	d.
Palladium	oz.	7	5	0
Platinum	„	28	10	0
Rhodium	„	41	0	0
Ruthenium	„	18	0	0
Selenium	lb.		nom.	
Silicon 98%	ton		nom.	
Silver Spot Bars	oz.		6	6¼
Tellurium	lb.		15	0
Tin	ton	793	10	0
***Zinc**				
Electrolytic	ton		—	
Min 99·99%	„		—	
Virgin Min 98%	„	86	2	6
Dust 95/97%	„	114	0	0
Dust 98/99%	„	120	0	0
Granulated 99+%	„	111	2	6
Granulated 99·99+%	„	124	18	9

* *Duty and Carriage to customers' works for buyers' account.*

Foreign Quotations

Latest available quotations for non-ferrous metals with approximate sterling equivalents based on current exchange rates

	Belgium fr/kg ≏£/ton		**Canada** c/lb ≏£/ton		**France** fr/kg ≏£/ton		**Italy** lire/kg ≏£/ton		**Switzerland** fr/kg ≏£/ton		**United States** c/lb ≏£/ton	
Aluminium			22.50	185 17 6	224	168 0	375	221 5	2.50	212 10	26.80	214 10
Antimony 99.0					220	163 0	445	262 10			29.00	232 0
Cadmium					1.300	975 0					120.00	960 0
Copper												
Crude												
Wire bars 99.9							455	268 10				
Electrolytic	32.50	239 5 0	29.00	238 12 6	327	245 2 6			2.75	233 17 6	30.00	240 0
Lead			10.75	88 12 6	106	79 10	167	98 12 6	.88	74 17 6	13.00	104 0
Magnesium												
Nickel			70.00	578 5	900	675 0	1,200	708 0	7.50	637 10	74.00	592 0
Tin	111.50	820 17 6			1,122	841 12 6	1,500	885 0	9.70	824 12 6	102.12	816 17 6
Zinc												
Prime western			11.75	97 0 0							11.00	88 0
High grade 99.95			12.35	102 0 0								
High grade 99.99			12.75	105 2 6								
Thermic					126.00	94 12 6						
Electrolytic					134.00	99 12 6	191	112 12 6	1.05	89 2 6	12.55	100 10

Non-Ferrous Metal Prices (continued)

Ingot Metals

All prices quoted are those available at 2 p.m. 9/9/59

		£	s.	d.
Aluminium Alloy (Virgin)				
B.S. 1490 L.M.5	ton	210	0	0
B.S. 1490 L.M.6	„	202	0	0
B.S. 1490 L.M.7	„	216	0	0
B.S. 1490 L.M.8	„	203	0	0
B.S. 1490 L.M.9	„	203	0	0
B.S. 1490 L.M.10	„	221	0	0
B.S. 1490 L.M.11	„	215	0	0
B.S. 1490 L.M.12	„	223	0	0
B.S. 1490 L.M.13	„	216	0	0
B.S. 1490 L.M.14	„	224	0	0
B.S. 1490 L.M.15	„	210	0	0
B.S. 1490 L.M.16	„	206	0	0
B.S. 1490 L.M.18	„	203	0	0
B.S. 1490 L.M.22	„	210	0	0
Aluminium Alloys (Secondary)				
B.S. 1490 L.M.1	ton	152	0	0
B.S. 1490 L.M.2	„	162	0	0
B.S. 1490 L.M.4	„	178	0	0
B.S. 1490 L.M.6	„	188	0	0
***Aluminium Bronze**				
BSS 1400 AB.1	ton	237	0	0
BSS 1400 AB.2	„	248	0	0

		£	s.	d.
***Brass**				
BSS 1400-B3 65/35	ton	156	0	0
BSS 249	„	—		
BSS 1400-B6 85/15	„	200	0	0
***Gunmetal**				
R.C.H. 3/4% ton	„	—		
(85/5/5/5) LG2	„	192	0	0
(86/7/5/2) LG3	„	202	0	0
(88/10/2/1)	„	240	0	0
(88/10/2/½)	„	252	0	0
***Manganese Bronze**				
BSS 1400 HTB1	„	186	0	0
BSS 1400 HTB2	„	202	0	0
BSS 1400 HTB3	„	213	0	0
Nickel Silver				
Casting Quality 12%	„	230	0	0
„ „ 16%	„	237	0	0
„ „ 18%	„	250	0	0
***Phosphor Bronze**				
B.S. 1400 P.B.1. (A.I.D. released)	„	289	0	0
B.S. 1400 L.P.B.1	„	213	0	0

**Average prices for the last week-end.*

		£	s.	d.
Phosphor Copper				
10%	ton	253	0	0
15%	„	255	10	0
Phosphor Tin				
5%	„	—		
Silicon Bronze				
BSS 1400-SB1	„	240	0	0
Solder, soft, BSS 219				
Grade C Tinmans	„	369	5	0
Grade D Plumbers	„	297	0	0
Grade M	„	405	5	0
Solder, Brazing, BSS 1845				
Type 8 (Granulated)	lb.	—		
Type 9	„	—		
Zinc Alloys				
Mazak III	ton	118	3	9
Mazak V	„	122	3	9
Kayem	„	128	3	9
Kayem II	„	134	3	9
Sodium-Zinc	lb.		2	7½

Semi-Fabricated Products

Prices vary according to dimensions and quantities. The following are the basis prices for certain specific products.

Aluminium					
Sheet	10	S.W.G.	lb.	2	8½
Sheet	18	S.W.G.	„	2	10½
Sheet*	24	S.W.G.	„	3	1½
Strip	10	S.W.G.	„	2	8½
Strip	18	S.W.G.	„	2	9½
Strip	24	S.W.G.	„	2	11
Circles	22	S.W.G.	„	3	2½
Circles	18	S.W.G.	„	3	1½
Circles	12	S.W.G.	„	3	0½
Plate as rolled			„	2	8
Sections			„	3	2
Wire 10 S.W.G.			„	2	11½
Tubes 1 in. o.d. 16 S.W.G.			„	4	1
Aluminium Alloys					
BS1470. HS10W.					
Sheet	10	S.W.G.	„	3	1
Sheet	18	S.W.G.	„	3	3½
Sheet	24	S.W.G.	„	3	11
Strip	10	S.W.G.	„	3	1
Strip	18	S.W.G.	„	3	2½
Strip	24	S.W.G.	„	3	10½
BS1477. HP30M.					
Plate as rolled			„	2	11
BS1470. HC15WP.					
Sheet	10	S.W.G.	„	3	9½
Sheet	18	S.W.G.	„	4	2
Sheet	24	S.W.G.	„	5	0½
Strip	10	S.W.G.	„	3	10½
Strip	18	S.W.G.	„	4	2
Strip	24	S.W.G.	„	4	9½
BS1477. HPC15WP.					
Plate heat treated			„	3	6½
BS1475. HG10W.					
Wire	10	S.W.G.	„	3	10½
BS1471. HT10WP.					
Tubes 1 in. o.d. 16 S.W.G.			„	5	0½
BS1476. HE10WP.					
Sections			„	3	1½
Brass					
Tubes			„	1	10½
Brazed Tubes			„	3	0½
Drawn Strip Sections			„	—	
Sheet			ton	202	10 0
Strip			„	202	10 0
Extruded Bar			lb.	2	0½
Extruded Bar (Pure Metal Basis)			„	—	

Brass				
Condenser Plate (Yellow Metal)	ton	193	0	0
Condenser Plate (Naval Brass)	„	205	0	0
Wire	lb.	2	8½	
Beryllium Copper				
Strip	„	1	4	11
Rod	„	1	1	6
Wire	„	1	4	9
Copper				
Tubes	lb.	2	3½	
Sheet	ton	268	5	0
Strip	„	268	5	0
Plain Plates	„	—		
Locomotive Rods	„	—		
H.C. Wire	„	286	15	0
Cupro Nickel				
Tubes 70/30	lb.	3	6½	

Lead				
Pipes (London)	ton	111	5	0
Sheet (London)	„	109	0	0
Tellurium Lead	„	£6 extra		
Nickel Silver				
Sheet and Strip 7%	lb.	3	8½	
Wire 10%	„	4	3½	
Phosphor Bronze				
Wire	„	4	1½	
Titanium (1,000 lb. lots)				
Billet 4½" to 18" dia.	lb.	54/-	55/-	
Rod ¼" to 4" dia.	„	95/-	62/-	
Wire ·036" – ·232" dia.	„	167/-	110/-	
Strip ·003" to ·048"	„	200/-	75/-	
Sheet 8'×2'. 20 gauge	„	85/-		
Tube, representative average gauge	„	300/-		
Extrusions	„	105/-		
Zinc				
Sheet	ton	122	5	0
Strip	„	nom.		

Domestic and Foreign

Merchants' average buying prices delivered, per ton, 8/9/59.

	£
Aluminium	
New Cuttings	145
Old Rolled	126
Segregated Turnings	99
Brass	
Cuttings	160
Rod Ends	149
Heavy Yellow	124
Light	118
Rolled	152
Collected Scrap	121
Turnings	143
Copper	
Wire	214
Firebox, cut up	206
Heavy	201
Light	195
Cuttings	213
Turnings	196
Braziery	163
Gunmetal	
Gear Wheels	178
Admiralty	178
Commercial	162
Turnings	158
Lead	
Scrap	61
Nickel	
Cuttings	—
Anodes	550
Phosphor Bronze	
Scrap	163
Turnings	158
Zinc	
Remelted	75
Cuttings	61
Old Zinc	40

Metal Statistics

Detailed figures of the consumption and output of non-ferrous metals for the month of June, 1959, have been issued by the British Bureau of Non-Ferrous Metal Statistics, as follows in long tons:—

COPPER	Gross Weight	Copper Content
Wire	22,231	22,785
Rods, bars and sections	13,526	8,901
Sheet, strips and plate	14,220	11,237
Tubes	7,576	7,055
Castings and miscellaneous	6,325	—
Sulphate	3,776	—
	68,654	56,112
Of which:		
Consumption of Virgin Copper		44,761
Consumption of Copper and Alloy Scrap (Copper Content)		11,351

LEAD	
Cables	8,366
Batteries	2,502
Battery Oxides	2,522
Tetra Ethyl Lead	2,401
Other Oxides and Compounds	2,288
White Lead	794
Shot	326
Sheet and Pipe	6,054
Foil and Collapsible Tubes	374
Other Rolled and Extruded	635
Solder	1,268
Alloys	1,423
Miscellaneous Uses	1,146
Total	30,099

TIN	
Tinplate	1,022
Tinning:	
Copper Wire	48
Steel Wire	8
All other	65
Solder	183
Alloys	457
Foil and Collapsible Tubes, etc.	57
Tin Compounds, Salts, and Miscellaneous Uses	147
Total Consumption	1,987

ZINC	
Galvanizing	9,103
Brass	9,080
Rolled Zinc	2,039
Zinc Oxide	2,473
Zinc Die-casting alloy	5,470
Zinc Dust	1,083
Miscellaneous Uses	973
Total, All Trades	30,221
Of which:	
High purity 99·99 per cent	5,961
Electrolytic and high grade 99·95 per cent	5,324
Prime Western, G.O.B. and debased	11,241
Remelted	515
Scrap Brass and other Cu alloys	3,945
Scrap Zinc, alloys and residues	3,016

ANTIMONY	
Batteries	98
Other Antimonial Lead	41
Bearings	31
Oxides—for White Pigments	142
Oxides—other	31
Miscellaneous Uses	16
Sulphides	7
Total Consumption	366
Antimony in Scrap	
For Antimonial Lead	320
For Other Uses	16
Total Consumption	336

CADMIUM	
Plating Anodes	54·60
Plating Salts	10·75
Alloys: Cadmium Copper	4·15
Alloys: Other	3·90
Batteries: Alkaline	8·95
Batteries: Dry	0·40
Solder	7·80
Colours	24·75
Miscellaneous Uses	1·80
Total Consumption	117·10

Scrap Metal Prices

The figures in brackets give the English equivalents in £1 per ton:—

West Germany (D-marks per 100 kilos):		
Used copper wire	(£205.17.6)	235
Heavy copper	(£201.10.0)	230
Light copper	(£170.17.6)	195
Heavy brass	(£118.5.0)	135
Light brass	(£96.12.6)	105
Soft lead scrap	(£56.0.0)	64
Zinc scrap	(£38.12.6)	44
Used aluminium unsorted	(£105.2.6)	120
France (francs per kilo):		
Electrolytic copper scrap	(£187.12.6)	250
Heavy copper	(£187.12.6)	250
No. 1 copper wire	(£172.12.6)	230
Light brass	(£122.0.0)	160
Zinc castings	(£51.0.0)	68
Lead	(£69.0.0)	92
Aluminium	(£129.12.6)	173
Italy (lire per kilo):		
Aluminium soft sheet clippings (new)	(£200.15.0)	340
Aluminium copper alloy	(£135.17.6)	230
Lead, soft, first quality	(£77.5.0)	131
Lead, battery plates	(£43.0.0)	73
Copper, first grade	(£221.5.0)	375
Copper, second grade	(£209.10.0)	355
Bronze, first quality machinery	(£203.2.6)	345
Bronze, commercial gunmetal	(£174.10.0)	295
Brass, heavy	(£144.10.0)	245
Brass, light	(£237.17.6)	225
Brass, bar turnings	(£135.17.6)	230
New zinc sheet clippings	(£65.0.0)	110
Old zinc	(£50.2.6)	85

Trade Publications

Head Wrightson Activities. — Head Wrightson and Co. Ltd., Ship House, Buckingham Gate, London, S.W.1.

An interesting brochure in colour, covering 24 pages, gives details of the many and diverse interests of this well-established company. These activities are centred on the supply of equipment for those heavy industries which are concerned with the extraction of mineral and metal ores and oil from the earth; the processing of coal, ferrous and non-ferrous metals; the refining of oil; and the production of equipment and components for all forms of transport on land and sea and in the air. More recently the company, through its wide group of companies, have entered the field of nuclear power, and have undertaken the design and manufacture of nuclear research and power plant, and are handling several overseas contracts for research reactors.

Mechanical Handling. — Aabacas Engineering Co. Ltd., Birkenhead.

Dealing with this company's range of cranes and hoists, many illustrations are given of the various equipment installed by the company and of the various types of such equipment which they make.

Carbon Vanes. — The Morgan Crucible Company Limited, Battersea Church Road, London, S.W.11.

A coloured card draws attention to the Morganite carbon vanes for rotary air or gas compressors and liquid pumps. These vanes are made in materials ranging from graphite-carbon to metal graphite—with properties which commend their use under widely differing conditions and for applications in which other vane materials may be found unsuitable.

Tube Bending Machine. — The Addison Tool Company Limited, 28 Marshalsea Road, London, S.E.1.

This company are distributors in this country for the "Super Universal 45" motorized tube bending machine, which has a capacity for tubes up to 1¼ in. dia. with a maximum wall thickness of ¼ in., and enables bends up to 8 in. maximum radius to be formed through angles up to 180°. A leaflet gives details and illustrations of this machine.

Pneumatic Equipment.—Air Automation, 26 Sharrocks Street, Wolverhampton, Staffs.

The range of products listed in this 24-page catalogue represents the result of a number of years of research into the problem of producing pneumatic equipment which will be completely reliable in use, of moderate price, and arranged so that the design engineer's task is made as simple as possible. The items detailed and illustrated include valves, cleaners, lubricators, tubing, blow guns, air line fittings, cylinders, vices, core box air vents, etc.

Incandescent Cupolas.—The Incandescent Heat Company Ltd., Cornwall Road, Smethwick, Birmingham.

This twelve-page brochure is devoted to details of the company's Incandescent-Whiting cupolas and chargers. A number of interesting photographs are given of various installations which have been made by the company for many important engineering firms in this country and abroad.

THE STOCK EXCHANGE

Reaction Throughout The Industrial Share Market Particularly Among Steels

ISSUED CAPITAL •	AMOUNT OF SHARE	NAME OF COMPANY	MIDDLE PRICE 7 SEPTEMBER	+RISE—FALL	DIV. FOR LAST FIN. YEAR	DIV. FOR PREV. YEAR	DIV. YIELD	1959 HIGH	1959 LOW	1958 HIGH	1958 LOW
£	£				Per cent	Per cent					
4,435,792	1	Amalgamated Metal Corporation ...	26/9	—3d.	9	9	6 14 6	27/4½	23/3	24/9	17/6
400,000	2/–	Anti-Attrition Metal	1/3		4	8½	6 15 0	1/6	1/3	1/9	1/3
41,303 829	Stk. (£1)	Associated Electrical Industries ...	60/–	—1/–	15	15	5 0 0	63/6	54/–	58/9	46/6
1,613,280	1	Birfield	59/6	—6d.	15	15	5 0 9	60/–	46/9	62/4½	46/3
3,196,667	1	Birmid Industries	81/3	—9d.	17½	17½	4 6 3	82/–	72/–	77/6	55/3
5,630,344	Stk. (£1)	Birmingham Small Arms	45/–	—1½d.	11	10	4 17 9	48/3	36/1½	39/–	23/9
203,150	Stk. (£1)	Ditto Cum. A. Pref. 5%	15/6		5	5	6 9 0	16/3	15/–	16/1½	14/7½
350,580	Stk. (£1)	Ditto Cum. B. Pref. 6%	18/10½		6	6	6 7 0	18/10½	17/9	17/4½	16/6
500,000	1	Bolton (Thos.) & Sons	33/9		10	10	5 18 6	34/–	27/6	28/9	24/–
300,000	1	Ditto Pref. 5%	15/6		5	5	6 9 0	15/6	14/–	16/–	15/–
160,000	1	Booth (James) & Co. Cum. Pref. 7%	20/6		7	7	6 16 6	20/6	20/–	20/4½	19/–
1,500,000	Stk. (£1)	British Aluminium Co. Pref. 6% ...	20/6		6	6	5 17 6	20/7½	18/9	20/–	18/4½
17,247,070	Stk. (£1)	British Insulated Callender's Cables	52/9	—6d.	12½	12½	4 14 9	57/–	46/3	52/6	38/9
17,047,166	Stk. (£1)	British Oxygen Co. Ltd., Ord. ...	62/6	—4/3	10	10	3 4 0	66/9	49/3	52/–	28/3
1,200,000	Stk. (5/–)	Canning (W.) & Co.	14/9	—4½d.	25+*2½C‡	25	4 4 9	16/–	12/3	25/3	19/3
60,484	1/–	Carr (Chas.)	2/10½	+1½d.	12½	25	4 7 0	2/10½	1/3	2/3	1/4½
555,000	1	Clifford (Chas.) Ltd.	27/–		10	10	7 8 3	26/6	22/6	22/–	16/–
45,000	1	Ditto Cum. Pref. 6%	17/–		6	6	7 1 3	16/9	15/3	16/–	15/–
250,000	2/–	Coley Metals	3/–		15	20	10 0 0	4/–	2/10½	4/6	2/6
10,185,696	1	Cons. Zinc Corp.†	64/6	—3/–	15	18¾	4 13 0	69/3	59/–	65/3	41/–
1,509,528	1	Davy & United	72/–xd	+1/6	30‡	20	4 3 3	74/3	43/1½	87/–	45/9
6,840,000	5/–	Delta Metal	17/7½	—4½d.	31‡	30	4 8 0	18/–	12/–	25/–	17/7½
5,296,550	Stk. (£1)	Enfield Rolling Mills Ltd.	55/9	—1/–	15	12½	5 7 6	57/6	36/7½	38/–	22/9
750,000	1	Evered & Co.	35/9		10§	15 Z	5 12 0	35/9	30/–	30/–	26/–
18,000,000	Stk. (£1)	General Electric Co.	38/3		10	10P	5 4 6	40/3	30/–	40/6	29/6
1,500,000	Stk. (10/–)	General Refractories Ltd.	37/–	—9d.	20	20	5 8 0	40/–	32/6	39/3	27/3
401,240	1	Gibbons (Dudley) Ltd.	63/6	—6d.	16½	15	5 4 0	66/6	63/6	67/6	61/–
750,000	5/–	Glacier Metal Co. Ltd.	8/3		11½	11½	6 18 9	9/3	6/7½	8/3	5/–
1,750,000	5/–	Glynwed Tubes	23/–	+1/–	20	20	4 7 0	23/–	16/4½	18/1½	12/10½
5,421,049	10/–	Goodlass Wall & Lead Industries ...	40/–	+1/–	13‖	18Z	3 5 0	39/–	28/7½	30/9	17/3
342,195	1	Greenwood & Batley	105/–		30	20	5 14 3	108/3	75/–	57/9	45/–
396,000	5/–	Harrison (B'ham) Ord.	19/3	—4½d.	*17½	*15	4 10 9	20/–	14/11½	15/9	11/6
150,000	1	Ditto Cum. Pref. 7%	19/6	+3d.	7	7	7 3 6	19/6	19/3	19/9	18/4½
1,075,167	5/–	Heenan Group	9/10½		10	10‡	5 1 3	10/6	7/6	9/7½	6/9
236,958,260	Stk. (£1)	Imperial Chemical Industries ...	39/6	—2/6	12Z	10	4 1 0	42/9	33/9	38/–	24/3
34,736,773	Stk. (£1)	Ditto Cum. Pref. 5%	17/4½	—4½d.	5	5	5 15 0	17/9	16/–	17/1½	16/–
14,584,025	**	International Nickel	174	—7	$2.60	$3.75	2 16 6	187½	154½	169	132½
300,000	1	Johnson, Matthey & Co. Cum. Pref. 5%	16/3		5	5	6 3 0	16/3	15/4½	16/9	15/–
6,000,000	1	Ditto Ord.	44/3	+6d.	12D	10	3 12 6	44/3	29/7½	47/–	36/6
600,000	10/–	Keith, Blackman	31/3		17½E	15	4 7 0	31/3	25/–	28/9	15/–
320,000	4/–	London Aluminium	6/3	—3d.	10	10	6 8 0	6/9	5/3	6/–	3/–
765,012	1	McKechnie Brothers Ord.	43/9	+2/6	15	15	6 17 0	45/–	41/–	45/–	32/–
1,530,024	1	Ditto A Ord.	42/–	+3/3	15	15	7 2 9	43/6	38/9	45/–	30/–
1,108,268	5/–	Manganese Bronze & Brass	14/6		20⅝	20	7 3 6	16/3	13/9	14/1½	8/9
50,628	6/–	Ditto (7½% N.C. Pref.)	6/–		7½	7½	7 10 0	—	—	6/3	5/6
13.098,855	Stk. (£1)	Metal Box	60/3		11	11	3 13 0	60/4½	44/7½	73/3	40/6
415,760	Stk. (2/–)	Metal Traders	12/–	—3d.	50	50	8 6 9	12/3	8/4½	9/–	6/3
160,000	1	Mint (The) Birmingham	28/–	+6d.	10	10	7 2 9	28/–	22/–	22/9	19/–
80,000	5	Ditto Pref. 6%	80/–		6	6	7 10 0	75/6	69/–	83/6	69/–
3,705,670	Stk. (£1)	Morgan Crucible A	58/6	+2/–	10	10	3 8 6	58/6	43/6	45/–	34/–
1,000,000	Stk. (£1)	Ditto 5½% Cum. 1st Pref. ...	18/–xd		5½	5½	6 2 3	18/6	17/6	18/–	17/–
2,200,000	Stk. (£1)	Murex	50/9	+3/–	15	17½	5 18 3	51/–	41/–	58/9	46/–
468,000	5/–	Ratcliffs (Great Bridge)	11/6		10R	10	3 5 3	11/6	9/6	11/1½	6/10½
234,960	10/–	Sanderson Bros. & Newbould ...	41/–		25	20	6 2 0	41/–	27/9	27/3	24/6
1,365,000	Stk. (5/–)	Serck	22/6	—6d.	15	17½	3 6 9	23/–	18/–	18/7½	11/–
6,698,586	Stk. (£1)	Stone-Platt Industries	51/3	—3d.	15	15	5 17 0	53/6	42/6	45/6	22/6¶
2,928,963	Stk. (£1)	Ditto 5½% Cum. Pref.	17/6		5½	5½	6 5 9	18/–	15/10½	16/3	12/7½
18,255,218	Stk. (£1)	Tube Investments Ord	88/9	—2/9	17½	15	3 19 0	91/6	72/–	86/–	48/4½
41,000,000	Stk. (£1)	Vickers	31/–	—1/–	10	10	6 9 0	37/–	29/9	36/3	28/9
750,000	Stk. (£1)	Ditto Pref. 5%	15/–		5	5	6 13 9	15/0½	14/3	15/9	14/3
6,863,807	Stk. (£1)	Ditto Pref. 5% tax free	22/–		*5	*5	6 15 3A	22/7½	20/6	23/–	21/3
2,200,000	1	Ward (Thos. W.), Ord.	101/–	+3d.	20	15	3 19 3	101/–	83/–	87/3	70/9
2,666,034	Stk. (£1)	Westinghouse Brake	46/9	+1/3	10	10	4 8 0	47/–	39/9	46/6	32/6
225,000	2/–	Wolverhampton Die-Casting ...	9/10½	—3d.	30	25	6 1 6	10/6	8/8½	10/1½	7/–
591,000	5/–	Wolverhampton Metal	29/9	—2/6	27½	27½	4 12 6	32/3	21/6	22/9	14/9
78,465	2/6	Wright, Bindley & Gell	7/–	—1½d.	20	20	7 2 9	7/1½	4/11½	5/4½	2/9
124,140	1	Ditto Cum. Pref. 6%	13/9		6	6	8 14 9	13/9	13/6	13/–	11/3
150,000	1/–	Zinc Alloy Rust Proof	3/4½	—1½d.	27	40D	8 0 0	3/9	2/9	3/1½	2/7½

*Dividend paid free of Income Tax. †Incorporating Zinc Corpn. & Imperial Smelting. **Shares of no Par Value. ‡ and 100% Capitalized issue. • The figures given relate to the issue quoted in the third column. A Calculated on £7 8 9 gross. Y Calculated on 11½% dividend. ‖Adjusted to allow for capitalization issue. E for 15 months. D and 50% capitalized issue. Z and 50% capitalized issue. B equivalent to 12½% on existing Ordinary Capital after 100% capitalized issue. ϕ And 100% capitalized issue. X Calculated on 17½%. C Paid out of Capital Profits. E and 50% capitalized issue in 7% 2nd Pref. Shares. P Interim dividend since reduced. § And Special distribution of 2½% free of tax. R And 33⅓% capitalized issue in 8% Maximum Ordinary 5/– Stock Units.

Most unusual . . . ha, ha, ha!

Frankly, the purpose of this advertisement is to bring to your notice that our prices for non-ferrous ingots of the highest quality may well be a good deal cheaper than those you are already paying— and our deliveries are exceptionally good, too. Then why the chap with the camouflaged neck? Well, we rather thought that at first sight you might be more interested in him than in us. But now we have come this far together, may we send you particulars of our production facilities and details of our very keen prices?

Write or telephone now to

Platt METALS LTD

PLATT METALS LIMITED • ENFIELD • MIDDLESEX • HOWARD 3351*

D

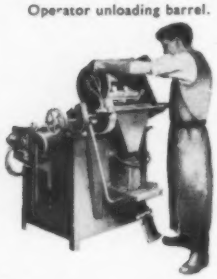
CANNING

NUMINIK

SUBMERGED
PLATING BARREL
Easily Unloaded

- For solutions other than chrome.
- Capacity 3 gallons of articles.
- Ideal for use in confined space with low headroom.
- Simple to operate.

Operator unloading barrel.



- The loaded barrel is so balanced that it can be raised and unloaded with the minimum of effort.
- Plated articles discharged through a chute into a basket.

Rapidity of loading and unloading with less operator fatigue is an outstanding feature of this barrel.

CANNING BIRMINGHAM • LONDON • SHEFFIELD

a drop of good stuff

in England too

A DROP OF GOOD STUFF means

SKLENAR *melted*

Beer or Brass, the English foundryman appreciates 'a drop of good stuff'. When it comes to melting, he and his colleagues the world over rely on SKLENAR furnaces, recognised as the best by far wherever metal is processed.

Higher output for less fuel—minimum metal loss—no crucibles—control of furnace atmosphere—easy access for skimming, alloying and refining—low heat-radiation—adaptable for a wide range of ferrous and non-ferrous metals, no contamination—quantities from a few pounds to several tons—oil, gas or coke fired.

50% higher output with REVERBALE melting and holding furnaces for the aluminium diecaster.

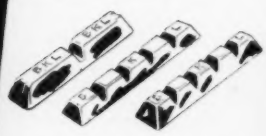
Send for full details of these and the range of SKLENAR furnaces. Prove their efficiency, 14 DAYS FREE TRIAL IN YOUR FOUNDRY.

SKLENAR FURNACES LIMITED

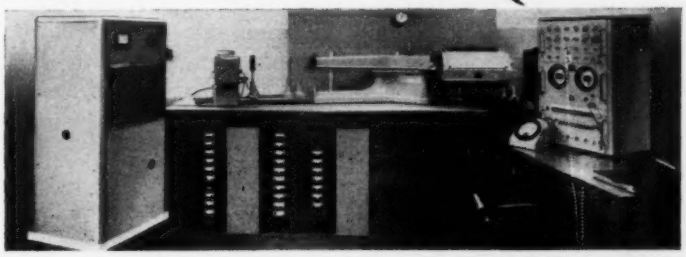
385 NEWPORT RD CARDIFF • TEL: CARDIFF 45645 (PRIVATE EXCHANGE) • GRAMS: SKLENAR CARDIFF 45645

P2583

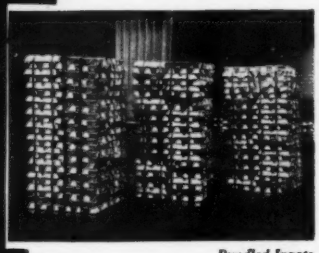
BKL aluminium alloys for quality



Casting Alloys *Wrought Alloys*
Master Alloys *Magnesium Alloys*
Granulated Aluminium Powder



Spectrograph at Kings Norton Works



Bundled Ingots

Our up-to-date Chemical Laboratory and Spectrographic Department ensures that our customers receive aluminium alloy ingots of the highest standards of quality. Supplied fully released to Air Ministry, Admiralty and War Office specifications where required. Write for our reference book of Aluminium Alloy Ingots below.

Despatch

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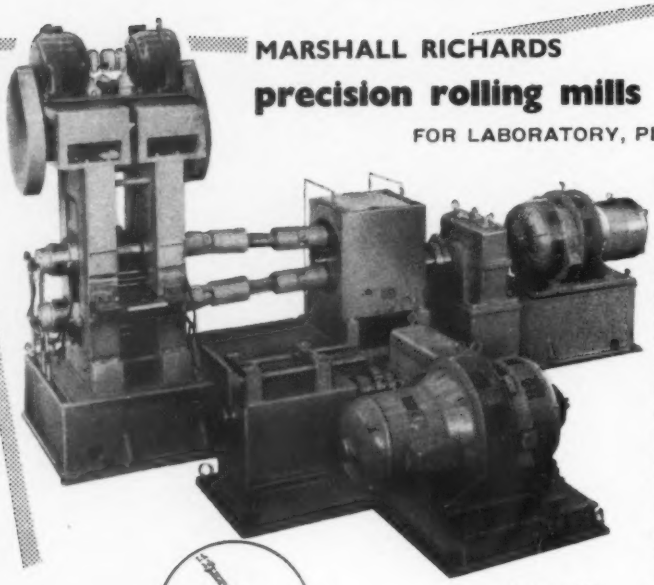

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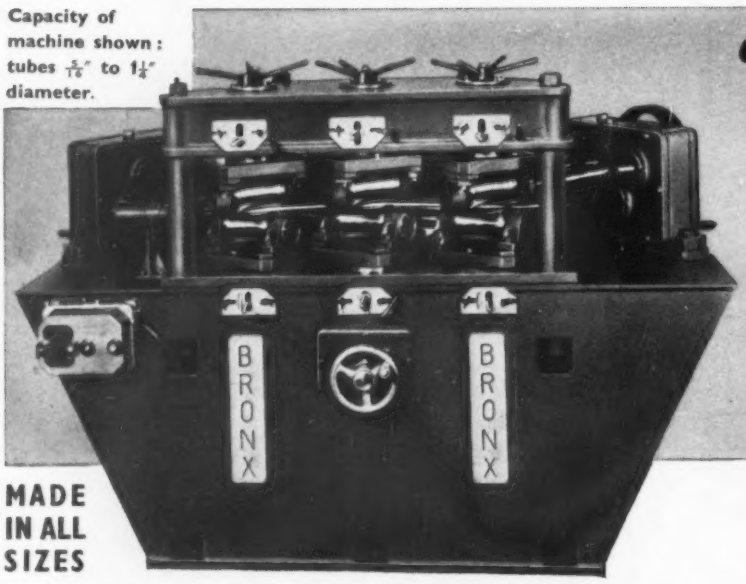

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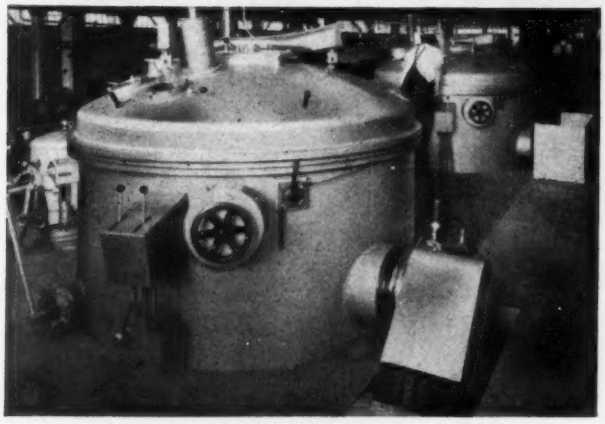

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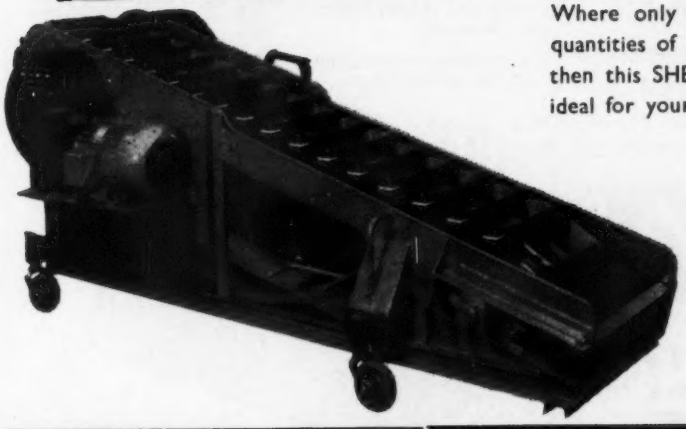

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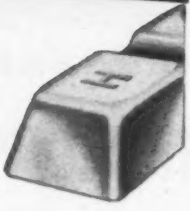

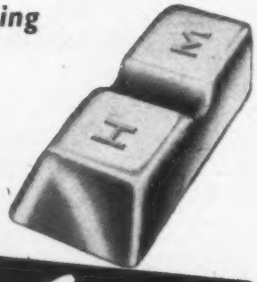

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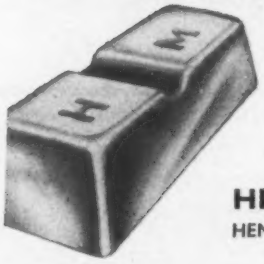

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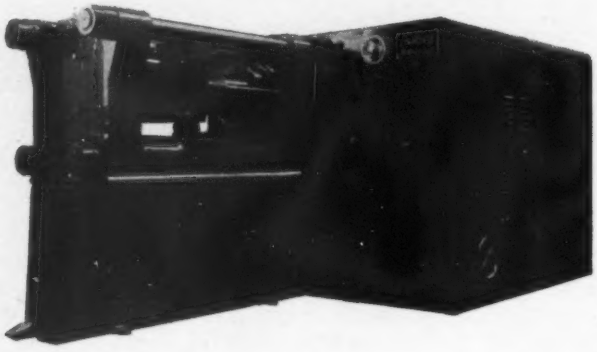

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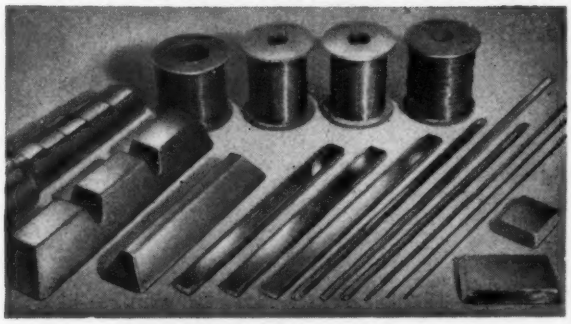

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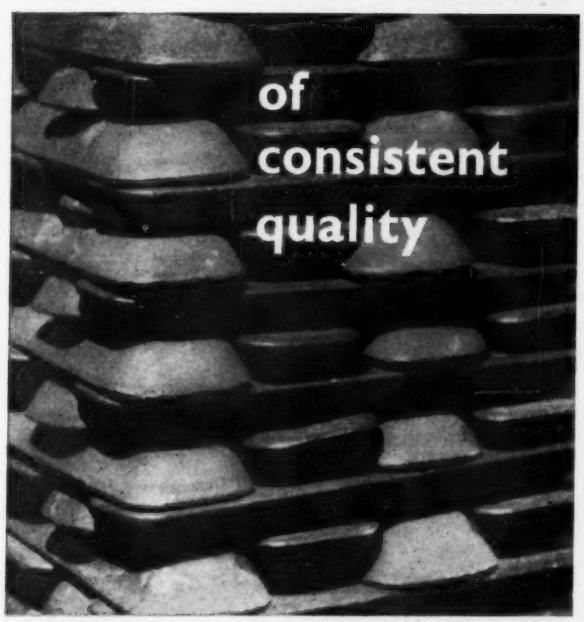

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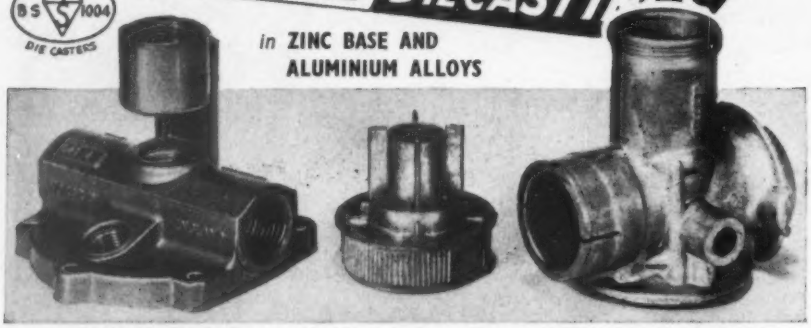

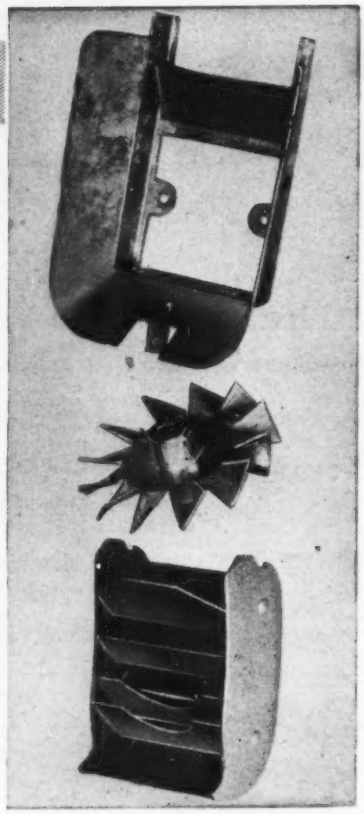

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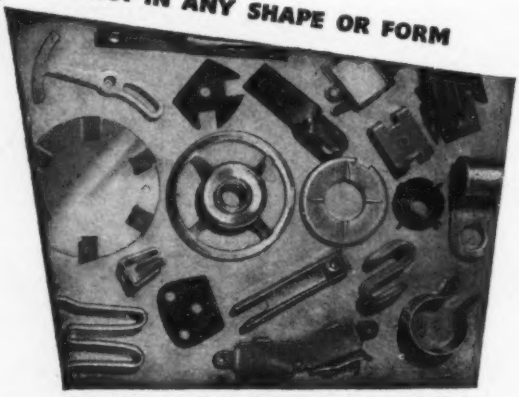

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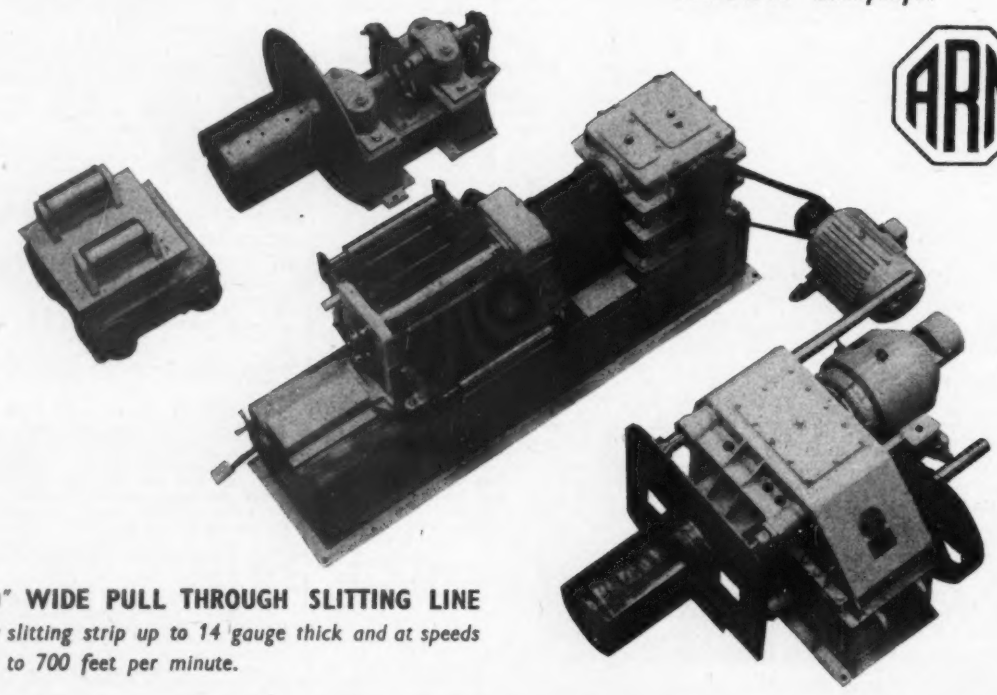

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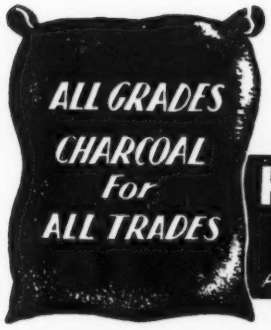

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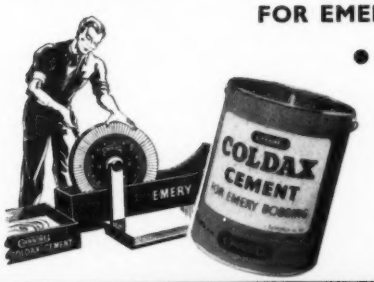

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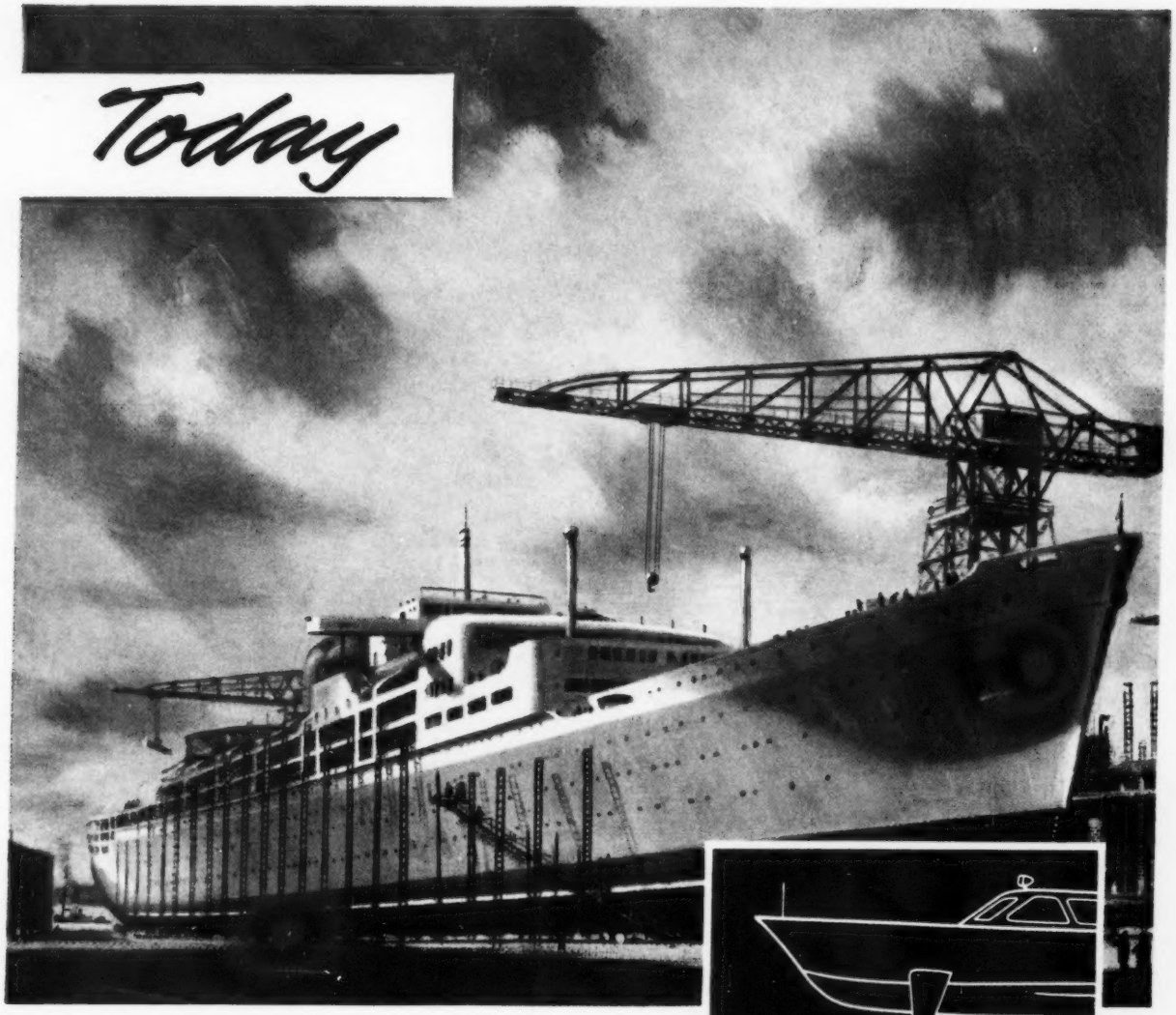

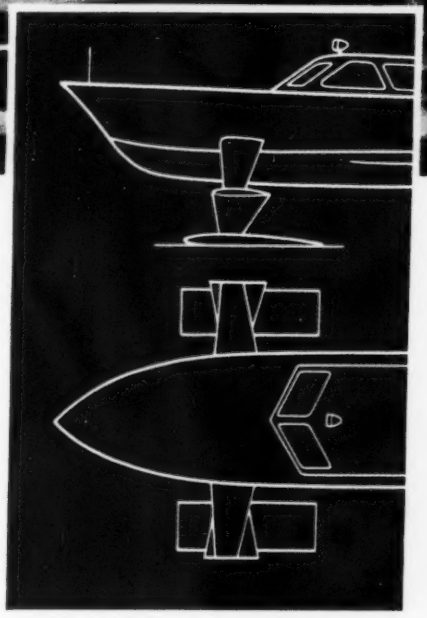

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